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The Marine Algæ of Iceland.

(I. Rhodophyceæ.)

By

Helgi Jónsson.

Introduction.

The first work mentioning Icelandic seaweeds is O. F. Müllers Enumeratio stirpium in Islandia sponte crescentium [1]). The later lists up to the middle of the last century are chiefly based upon this work. As the earlier literature has been critically treated by H. F. G. Strömfelt in his book: Om algvegetationen vid Islands kuster [2]), I shall not here enter upon the subject, but only refer to Strömfelts work.

In the following paper I only mention such Icelandic species as I have seen myself. The collections to which I had access are the following:

I. Old collections in the Botanical Museum at Copenhagen from the first half of the last century; as a rule nothing is written on the labels except that the plant has been gathered in Iceland, and generally the name of the collectors is not given, excepting some very few as Mörck (travelled in Iceland 1821), F. Faber (travelled in Iceland 1819—1821) and Japetus Steenstrup (travelled in Iceland 1840—1841). These collections are not mentioned by Strömfelt (l. c.).

[1]) Nova acta Physico-Medica Academiæ Cæsareæ Leopoldino-Carolinæ naturæ curiosorum. Tomus IV. Norimbergæ 1770.

[2]) Göteborgs Kongl. Vetenskaps och Vitterhets samhälles Handlingar. Ny tidsföljd, 21. häftet. Göteborg 1887.

II. New collections belonging to the Botanical Museum at Copenhagen from the second half of the last century made by following travellers:

1. Professor C. Grönlund, the author of „Islands Flora", travelled in Iceland in 1868 and 1876. He gathered some marine algæ in N. Iceland and SW. Iceland. His plants were determined and published by F. R. Kjellman[1]).

2. Dr. L. Kolderup Rosenvinge, who stopped at Reykjavík for a few days on his journey to Greenland 1886, gathered some marine algæ.

3. Mr. Hjalmar Jensen gathered in 1890 few specimens in NW. Iceland and SW. Iceland.

4. Mr. W. Lundbeck gathered some marine algæ in NW. Iceland in 1892 and 1893.

5. Mr. C. H. Ostenfeld, Inspector of the Botanical Museum at Copenhagen, has, as botanist of the Ingolf Expedition (1895—96), brought together a large and valuable collection of marine algæ from several places round Iceland.

6. The author of this paper has in 1894, 1897 and 1898 gathered marine algæ in many places round Iceland.

7. Mr. Ólafur Davíðsson has in 1897 and 1898 gathered many specimens in N. Iceland (Eyjafjörður and Grímsey).

8. Mr. Stefán Stefánsson, Mr. Bjarni Sæmundsson, Mr. C. Hansen, Mr. R. Hørring, Mr. A. C. Johansen and Mr. Guðmundur Guðmundsson have gathered some few specimens at the Icelandic coasts.

III. Mr. H. F. G. Strømfelt travelled in Iceland in 1883 and brought together a large collection, now to be found in the Riksmuseum at Stockholm. I have been able to use this collection, as by the kindness of the authorities of the Riksmuseum it has been lent to me here at Copenhagen.

Of the collections mentioned Mr. Ostenfelds, my own and Mr. Strömfelts are the most valuable and this paper is chiefly based upon them.

I have made references to the book of Strömfelt and the

[1]) Bidrag till kännedomen om Islands hafsalgflora. Botanisk Tidsskrift, 3. Række, 3. Bind. Kjøbenhavn 1879.

principal latest works on Arctic algæ: Kjellman, The Algæ of the Arctic Sea, and L. K. Rosenvinge, Grønlands Havalger.

I was enabled to get my collections in 1897 and to determine all the collections of marine algæ from Iceland by pecuniary support granted me by the Danish Carlsbergfond, the Directors of which I ask to accept my most heartfelt thanks.

I am indebted to the Icelandic Government and Althing for the pecuniary support granted me for travelling purposes in the year 1898.

I am also indebted to Mr. M. Foslie for his determining the Corallinaceæ. I am also highly indebted to my teacher, Dr. L. Kolderup Rosenvinge for his kind advice in many things.

Principal abbreviations:

C. O. = C. H. Ostenfeld.

Harv. Phyc. Brit. = W. H. Harvey: Phycologia Britannica. Vol. I.—III. London 1846—1851.

K. Rosenv. Grl. Havalg. = L. Kolderup Rosenvinge: Grønlands Havalger, Kjøbenhavn 1893. Meddelelser om Grønland III.

K. Rosenv. Deuxième Mém. = L. Kolderup Rosenvinge: Deuxième Mémoire sur les Algues marines du Groenland, Copenhague 1898. Meddelelser om Grønland XX.

Ldbk. = W. Lundbeck.

O. D. = Ólafur Davíðsson.

Reinkes Atlas = J. Reinke: Atlas deutscher Meeresalgen, Kiel 1889—92.

St. = Stefán Stefánsson.

Strömf. Algveg. = H. F. G. Strömfelt: Om algvegetationen vid Islands kuster, Göteborg 1887.

Rhodophyceæ.

Bangioideæ.

Fam. Bangiaceæ.

Bangia fuscopurpurea (Dillw.) Lyngb., Rosenv. Grl. Havalg. p. 831.

On rocks at high-water-mark. Collected with tetraspores in June-September, with cystocarps and antheridia in May-July and September. 3—10 cm. high. Probably common.

E. Icel. common and abundant.
N. Icel. Grímsey (O. D.); Eyjafjörður.
NW. Icel. Kolbeinsá, Skálholtsvík.
SW. Icel. Flatey, Stykkishólmur, Barkanautur.
S. Icel. Vestmannaeyjar.

Porphyra umbilicalis (L.) J. Ag., Rosenv. Grl. Havalg. p. 830, P. laciniata Strömf. Algveg. p. 34.

On rocks at high-water-mark. Common and abundant round the Icelandic coasts. Collected with tetraspores in March-October, with cystocarps in June-August, and with antherida in June. 16—26 cm. high and 4—37 cm. broad.

f. *typica* is the most common and

f. *laciniata* rather common.

f. *linearis*. In the lower litoral zone in Vestmannaeyjar I met with specimens (71 cm. long and 6 cm. broad) which were thicker, narrower and longer than usually. Probably the same form as mentioned by Strömfelt (l. c. p. 34) from E. Icel. and by him named f. linearis.

Porphyra miniata (Ag.) Ag., Rosenv. Grl. Havalg. p. 826. Diploderma m., D. tenuissimum, D. amplissimum Strömf. Algveg. p. 33.

In rock-pools in the lower litoral zone and in the upper sublitoral region to a depth af c. 10 fathoms.

F. *typica* is the most common and grows abundantly round the coasts of Iceland. Diploderma tenuissimum Strömf. I refer to the f. typica. I have examined one of Strömfelts original specimens, it was

soaked in lactophenol, and the thickness of the frond was 39 μ. The cells in the middle of the frond were nearly „fere quadraticae“. Generally I think that the formae of P. miniata are not distinguishable by the shape of the cells in the middle of the frond, as I have seen, in the same section, cells that were „quadraticae, fere quadraticae“ and „vertica-liter rectangulares“.

f. *amplissima* (Kjellm.) K. Rosenv. grows in still water beneath low-water-mark. At first it is attached to other algæ, but soon it becomes loose and its size increases. The largest collected specimen was 43 cm. long and 29 cm. broad. Specimens, which are folded in the way described by Kjellman (The Algæ of the Arctic Sea), sometimes occur, but often they are not more folded than the f. typica. F. amplissima is a form analogous to the great specimens of Monostroma fuscum, which also are loose and grow at low-water-mark in quiet water, often in company with the f. amplissima af P. miniata. In quiet creeks on sheltered coasts these two species, Porphyra miniata and Monostroma fuscum, when loosened from the substrata (algæ, stones, shells), to which they are fastened, increase in size and lie loose on the bottom of the sea. Such large specimina of P. miniata I call f. amplissima.

Probably common round Iceland.

E. Icel. common and abundant.
N. Icel. Grímsey (O. D.); Eyjafjörður.
NW. Icel. Hrútafjörður, Ísafjörður, Dýrafjörður (C. O.).
SW. Icel. common.
S. Icel. Vestmannaeyjar.

Porphyra coccinea J. Ag.

Few, sterile specimina on Desmarestia aculeata in a depth of 6—10 fathoms.

S. Icel. Vestmannaeyjar.

Conchocelis rosea Batters, On Conchocelis, a new genus of perforating Algæ in G. Murray: Phycological Memoirs I. London 1892.

In the sublitoral region to a depth af c. 20 fathoms in Balanus, Mya truncata, Cyprina islandica, Modiola, Astarte, Buccinum undatum, and Serpula, and in the litoral region in Spirorbis on Fucus. I have not seen the sporangia. In the inflated cells I have seen a distinct stellated chromatophore. Mr. Nadson[1]) thinks that Conchocelis rosea does not

[1]) G. Nadson: Die perforierenden (kalkborenden) Algen und ihre Bedeutung in der Natur, in Scripta Botanica Horti Universitatis Petropolitanae, fasc. XVIII. 1900.

belong to the Rhodophyceæ, but to the Chlorophyceæ, and he mentions it as a variety of Ostreobium Queketti Born. et Flah., var. rosea Nadson. He says that these two plants chiefly differ in the colour of the frond. As Conchocelis rosea is composed of articulated filaments without anastomoses, I cannot admit that Mr. Nadson is right in identifying it with Ostreobium Queketti. The Conchocelis rosea is still unsufficiently known, but I do not think that it will prove to be a Chlorophycea on further investigation.

E. Icel. Reyðarfjörður.
N. Icel. Eyjafjörður.
NW. Icel. Hrútafjörður, Ísafjörður; Dýrafjörður (C. O.); Arnarfjörður.
SW. Icel. Stykkishólmur, Reykjavík.
S. Icel. Vestmannaeyjar.

Florideæ.

Fam. **Helminthocladiaceæ.**

Chantransia virgatula (Harv.) Thur., Rosenv. Grl. Havalg. p. 824.

On Corallina, Callithamnion Arbuscula, Halosaccion and other algæ.

Collected with monospores in April—June. From a pluricellular, membranaceous base, one cell thick, rise one to three or more vertical filaments. The cells in the middle of the filament are three times longer than those near the base, 10—11 μ thick.

NW. Icel. Ísafjörður (C. O.).
SW. Icel. Hvammsfjörður, Reykjavík; Njarðvík (C. O.).

Chantransia secundata (Lyngb.) Thur., Rosenv. Grl. Havalg. p. 824.

On Sertularia and varions algæ e. g. Corallina, Rhodochorton Rothii a. o.

Collected with monospores in May—June and September.

The vertical filaments are 10—13 μ thick. This species cannot be distinguished from the last named by the thickness of the filaments, since both species have nearly the same thickness. The basal disk is as in C. virgatula, from which species it differs by its much shorter cells (cfr. also Rosenv. Grl. Havalg.) and more secund branches.

E. Icel. Hólmanes (C. O.).
SW. Icel. Reykjavík, Hafnarfjörður; Njarðvík (C. O.).
S. Icel. Vestmannaeyjar.

Chantransia Alariæ H. Jónsson n. sp.

Planta 0.5—1 mm. alta, villo denso, lanuginoso laminam Alariæ esculentæ investiens, filis erectis 1—2, pulchre roseis, e cellula

basilari unica egredientibus, inferne nudis, deinde ramos oppositos, alternos aut secundos gerentibus, inferiore parte 11—23 μ, superiore autem 7—11 μ crassis. Fila sterilia pilifera. Sporangia obovoidea-ellipsoidea in superiore parte cujusque cellulæ ramorum et supremi axis primarii sessilia, opposita et in ultima cellula terminalia, 17—22 μ longa, 10—11 μ crassa.

I found the lamina of a few specimens of Alaria esculenta almost totally covered with this alga. Sometimes I have seen that two branches or sporangia in the same heighth on the bearing axis are not opposite, but unilaterally placed side by side. The cells nearest the base are 24—56 μ long and 2—3 times longer than broad, in the middle 58—72 μ

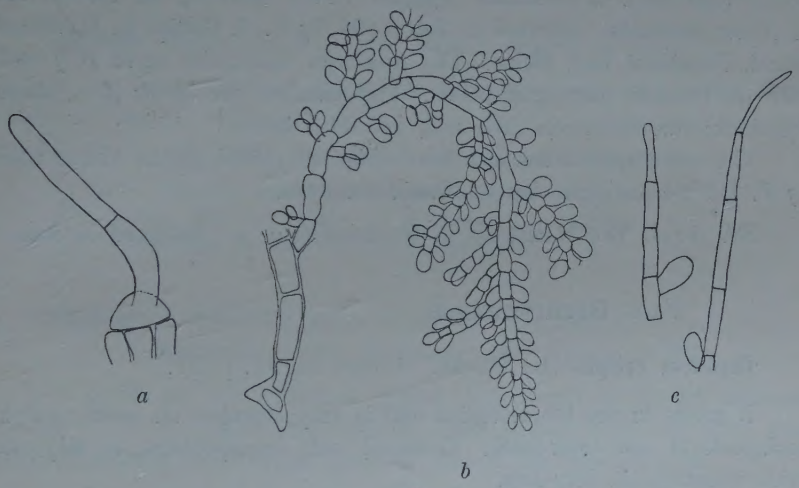

Fig. 1. *Chantransia Alariæ.*

a A young plant 380: 1. — *b* A plant with sporangia 138: 1.
c Two filaments with short hairs (1 + F. Zeiss).

long and 4—5 times longer than broad, and above 20—50 μ long and 3—6 times longer than broad. The upper end of the cells, especially in the branches, is broader than the lower end. In the young cells, especially the young tetrasporangia, a distinct star-shaped chromatophore, as in the above mentioned species, may be observed.

The only species of Chantransia with one basal cell, hitherto known, is C. microscopica (Naeg.) Fosl., described in the year 1860 by Naegeli in „Morphologie und Systematik der Ceramiaceen", but in the Deuxième Mém. s. l. Alg. d. Groenl., published in 1898, L. K. Rosenvinge decribes a new variety, var. collopoda, of C. microscopica.

Of all the Chantransia species I know, the C. Alariæ most resembles

this variety; but as it is different by distinct characters, being generally larger, the vertical filaments considerably thicker below than above, and the ramification first beginning at a considerable distance from the base, I have taken it as a new species.

I have seen specimens of C. Alariæ from Haugesund (Norway) collected by L. K. Rosenvinge the 6. Aug. 1885, growing on the lamina of Alaria esculenta, resting undetermined in the Bot. Mus. in Copenhagen. The Norwegian plants agree very well with the Icelandic specimens. The filaments are below 16 μ, above 8 μ thick; the sporangia 14—17 μ long and 10—11 μ broad.

In the Phycotheca boreali-americana Nr. 236 the same species also occurs (sub nom. C. secundata (Lyngb.) Thur.), growing on the lamina of Alaria esculenta, collected in July 1894 by F. S. Collins in Hardhead Island, Penobscot Bay, Maine. The American specimens agree very well with the Icelandic-Norwegian plants. The filaments are below 16 μ, above 8 μ thick; the sporangia 20 μ long and 14 μ broad.

The same species has also been collected (1895) in the Færöe Isles by F. Börgesen, growing on Alaria esculenta.

SW. Icel. The Maelstrom in Hvammsfjörður — Gathered in June.

Fam. **Gigartinaceæ.**

Chondrus crispus (L.) Stackh., Strömf. Algveg. p. 31.

It grows in the litoral region and is very common on rocks and in rock-pools at low-water-mark. Collected with tetrasporangia in May and with cystocarps in May-July.

The thallus of this species is varying in breadth and ramification and thus there occur three forms:

F. *typica* (fig. Kütz. Tab. phyc. Vol. 17, Tab. 49 a) is the most common form, 9—11 cm. high; the upper branches 2—5 mm. broad.

F. *latifrons* Le Jolis: Algues marines de Cherbourg Nr. 164 (fig. Harv. Phyc. Brit. Tab. 63 f. 2) with few and broad branches, 8—10 cm. high; the upper branches 5—10 mm. broad. In S. and SW. Icel.

F. *angustifrons* Le Jolis: Algues marines de Cherbourg Nr. 224. (fig. Harv. Phyc. Brit. Tab. 63 f. 1) richly branched, 15 cm. high; the upper branches 2—3 mm. broad.

These three forms are connected with numerous intermediate forms and both the broad and the small forms are not always with certainty to be distinguished from the f. typica.

NW. Icel. Cast ashore at Isafjörður (Strömfelt).
SW. Icel. and S. Icel. common.

Gigartina mamillosa (Good. et Wood.) J. Ag., Strömf. Algveg. p. 31.

It grows in the litoral zone on rocks and in rock-pools at low-water-mark in company with Chondrus crispus. Collected with cystocarps in July-Sept. The frond is 4—8 cm. high, varying in breadth; the broader forms — 6—7 mm. broad — occur in S. and SW. Icel. In Seyðisfjörður (E. Icel.) I met with a sterile form, f. *linearis*, with fronds 10 cm. high, much narrower than in f. *typica* and nearly unbranched.

E. Icel. Seyðisfjörður.
N. Icel. Eyjafjörður.
NW. Icel. Hrútafjörður.
SW. Icel. and S. Icel. common.

Ahnfeltia plicata (Huds.) Fries, Strömf. Algveg. p. 31.

In the litoral zone on rocks near low-water-mark, and in the upper sublitoral region. Collected only sterile, in April—June and October. Fronds 8—10 cm. high. Specimens with galls are not rare.

N. Icel. Washed ashore in Skagafjörður (Strömfelt).
NW. Icel. Washed ashore at Ísafjörður (Strömfelt).
SW. Icel. and S. Icel. rather common.

Phyllophora Brodiæi (Turn.) J. Ag.
* **interrupta** (Grev.) K. Rosenv. Grl. Havalg. p. 821.

It grows in the sublitoral region in a depth af 3—14 fathoms. Fronds 5—7 cm. high. This species, only known from the Artic area of the Icelandic seas, occurs probably also in the Atlantic area.

E. Icel. Húsavík, Brunavík, Borgarfjörður.
NW. Icel. Önundarfjörður, Dýrafjörður (Ldbk.).

Phyllophora membranifolia (Good. et Wood.) J. Ag., Strömf. Algveg. p. 30.

In the lower litoral zone. Fronds 4—7 cm. high. The leaves 3—7 mm. broad.

SW. Icel. Hjallasandur; Reykjavík, Njarðvík (C. O.).
S. Icel. Eyrarbakki (Strömfelt).

Phyllophora rubens (Good. et Wood.) Grev.

In the herbarium of the Bot. Mus. in Copenhagen there are some specimens of this plant, which are said to have been collected in Iceland. On the label is written in Miss Caroline Rosenbergs handwriting: Ex Islandia. As both the finding-place in Iceland and the collector are unknown, I mention this species here as a doubtful Icelandic plant.

Actinococcus subcutaneus (Lyngb.) K. Rosenv. Grl. Havalg. p. 822.

In the latest treatise on this Alga[1]), Darbishire mentions it as a distinct species growing parasitically on the antheridia of Phyllophora Brodiæi.

On Phyllophora Brodiæi * interrupta.

E. Icel. Húsavík, Brúnavík.
NW. Icel. Önundarfjörður (Ldbk.).

Ceratocolax Hartzii K. Rosenv. Deuxième Mém. p. 34.

On Phyllophora Brodiæi * interrupta in a depth of 14 fathoms. With tetrasporangia in May.

NW. Icel. Önundarfjörður (Ldbk.).

Fam. **Rhodophyllidaceæ.**

Cystoclonium purpurascens (Huds.) Kütz., Strömf. Algveg. p. 30.

In the lower litoral zone. Collected with tetraspores in NW. Icel. in September. Sometimes it occurs with tendrils. Fronds 10—22 cm. high.

NW. Icel. Hrútafjörður, Kollafjörður. Cast ashore at Isafjörður. (Strömfelt).
SW. Icel. and S. Icel. common.

Turnerella Pennyi (Harv.) Schmitz, K. Rosenv. Deuxième Mém. p. 29.

It grows in the sublitoral region on Lithothamnion in company with Polysiphonia arctica in a depth of 4—29 (usually 10) fathoms. I have met with small specimens, 5 mm. high and 3 mm. broad, bearing a close similitude to T. septemtrionalis, attached to Lithothamnion, growing in company with larger specimens, 5 cm. high and 7.5 cm. broad, which in everything except that they were attached, resemble the T. Pennyi. I refer without any hesitation all the Icelandic specimens to this species. Regarding the further difference between T. Pennyi and T. septemtrionalis cfr. K. Rosenv. Deuxième Mém.

E. Icel. rather common. Reyðarfjörður, Seyðisfjörður.
N. Icel. Eyjafjörður.

Euthora cristata (L.) J. Ag., Strömf. Algveg. p. 27.

It grows in the sublitoral region in a depth of 2—20 fathoms on the fibers of Laminariæ, especially L. hyperborea, on shells and various

[1]) Annals of Botany Vol. 13, 1899.

substrata. Collected with cystocarps in May—Sept., with tetraspores in April—June.

Low specimens, 1.5—2.5 cm. high, with proportionally broad fronds, the f. *typica* Kjellm., and higher specimens, 5 cm. high, with proportially narrow fronds, the f. *angustata* Lyngb., seem to be equally common.

Probably common round the Icelandic coasts.

E. Icel. common.
N. Icel. Ásmundarstaðir (St.); Eyjafjörður.
NW. Icel. and SW. Icel. common.
S. Icel. Vestmannaeyjar.

Rhodophyllis dichotoma (Lepech.) Gobi., Strömf. Algveg. p. 26.

Sublitoral in a depht of 2—20 (usually 5—10) fathoms. Collected with cystocarps and tetraspores in May and July.

All the Icelandic specimens belong to the f. *typica,* and I have only met with few specimens that somewhat resembled the f. *fusca* Lyngb.

Probably common round the Icelandic coasts.

E. Icel. common.
N. Icel. Ásmundarstaðir (St.); Grímsey (O. D.); Eyjafjörður.
NW. Icel. and SW. Icel. common.

Fam. **Rhodymeniaceæ.**

Rhodymenia palmata (L.) Grev., Kjellm. The Algæ of the Arctic Sea p. 147. Strömf. Algveg. p. 27. R. pertusa Strömf. l. c. p. 28.

It grows in the lower part of the litoral zone, especially in rock-pools, and in the upper part of the sublitoral region. Very common and abundant round the Icelandic coasts. Collected with tetraspores in Febr., April—May, July and October, with antheridia in January.

F. *typica* Kjellm. l. c. (Fig. Turn. Hist. Fuc. T. 115, f. a.) To the f. *typica* of this many-shaped species, I refer all the Icelandic specimens, which have „the majority of the secondary axes formed by repeatedly subdichotomous branching". So taken the f. *typica* is a various forma and connected with the f. *prolifera* by intermediate forms. It has a height of 2—41 cm. and a breadth of 4—10 cm. The length and the breadth of the divisions are very different. When the divisions are many and become very narrow, the plant superficially resembles the f. *sarniensis,* but differs from it by the broad, cuneate base. The length of the divisions is varying from c. $^1/_5$ to $^4/_5$ of the length of the frond. Sometimes there occur specimens, the divisions of which are few, very short and proportionally broad. The frond of these specimens is usually of a

oblong, triangular form, with a broad, cuneated base. Such specimens Strömfelt has determined as *R. pertusa.*

Undivided specimens also occur.

Specimens, which have the margin winged with small leaflets (*β. marginifera* Harv.) are not rare, but specimens without such small leaflets (*α. nuda* Kjellm.) are much more common.

F. *prolifera* Kjellm. l. c. (Fig. Turn. Hist. Fuc. T. 115, f. c.) is rather common.

Lomentaria clavellosa (Turn.) Gaill.; Le Jol. Liste des Algues mar. de Cherb. p. 132.

var. *sedifolia* Ag.

On the fibers of Laminaria hyperborea in a depth of 10—20 fathoms.

S. Icel. Vestmannaeyjar.

Lomentaria rosea (Harv.) Thur., Le Jol. Liste des Alg. mar. de Cherb. p. 131. Fig. Harv. Phyc. Brit. T. 358 and 301.

On the fibers of Laminaria hyperborea in company with the last species.

S. Icel. Vestmannaeyjar.

Plocamium coccineum (Huds.) Lyngb., Strömf. Algveg. p. 27.

In the lower litoral zone. Collected with tetraspores in May-June. 4—14 cm. high.

S. Icel. Staður (C. O.); Eyrarbakki (Strömfelt); Vestmannaeyjar.

Halosaccion ramentaceum (L.) J. Ag., Kjellm., The Algæ of the Arctic Sea p. 153, Strömf., Algveg. p. 29.

It grows abundantly in the lower litoral zone, especially in rock-pools. It is a multiform species and is very common round the Icelandic coasts. Collected with tetraspores in March-July and December. With antheridia in April—May. It is 10—35 cm. long. Of all the forms the f. *robusta* is the largest. The most common forms are the following:

f *robusta* Kjellm. (Fig. Kjellm. l. c. T. 12, f. 4, Lepech. Comm. Petrop. 19 B., T. XXIII). Syn. f. hispida Strömf. l. c. p. 29.

f. *ramosa* Kjellm.

f. *densa* Kjellm. (Fig. Turn. Hist. Fuc. T. 149).

f. *subsimplex* Rupr. (Fig. Kjellm. l. c. T. 13, f. 3).

f. *scopula* (Strömfelt) (Fig. Strömf. l. c. T. II, fig. 1).

The f. *scopula* has only been collected by Strömfelt in one place, Eyrarbakki in S. Icel. The f. *subsimplex* is rather common, the other

forms common. I refer Strömfelt's f. *hispida* to Kjellmans f. *robusta* according to Strömfelt's original specimens.

The f. *scopula* is mentioned by Strömfelt as a distinct species, H. scopula Strömf., but he shows that this species in the ramification resembles the f. subsimplex of H. ramentaceum. I have seen three original specimens of H. scopula Strömf., two of which resemble well enough Strömfelt's figure and description, but the third is a distinct f. *subsimplex* of H. ramentaceum. The H. scopula is different from the other forms of H. ramentaceum by the peculiar form of its ramification, but a similar ramification occurs in the f. subsimplex, although not so fasciculate. I have not met with specimens perfectly resembling the H. scopula, but

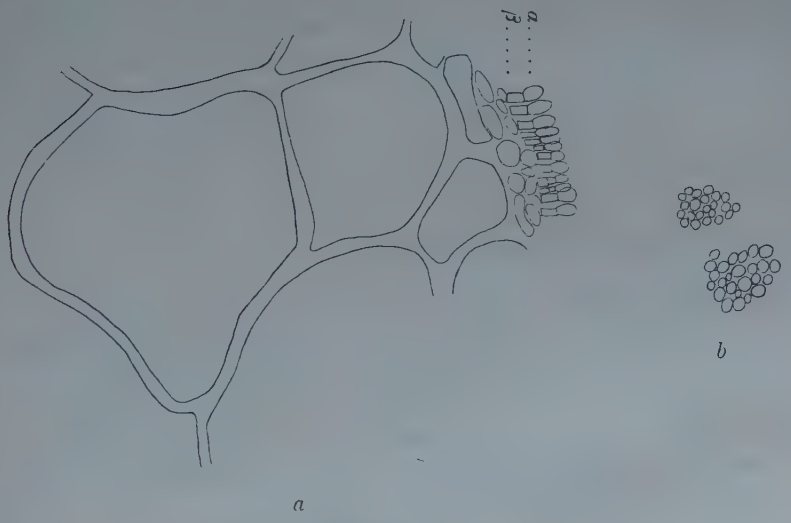

Fig. 2. *Halosaccion ramentaceum.*

a, transverse section of part of the thallus showing the antheridia (α) and the elongated cells (β) (384 : 1). — *b*, antheridia viewed from above (384 : 1).

sometimes I have found plants with a somewhat similar ramification, viz. specimens of f. subsimplex with many subfasciculated, adventitious shoots, which in most cases seems to have been caused by animals.

It is a well known fact that nobody has, as yet, succeeded in discovering the cystocarps of Halosaccion ramentaceum, and all that we know, as yet, about the antheridia, is to be found in Paul Kuckuck: Meeresalgen vom Sermitdlet und kleinen Karajakfjord[1]). The specimen,

[1]) Bibliotheca Botanica. Heft 42. 1897.

mentioned by Kuckuck, was transmitted to L. Kolderup Rosenvinge for examining. It differed from the usual *H. r.* in the smallness of the cortical cells, which formed a translucent layer. Both Kuckuck and Rosenvinge utter, with some hesitation, that the specimen probably was a male specimen of *H. r.* It is certainly a male specimen and does not seem to have fully developed antheridia.

I have met with several male specimens of H. ramentaceum. To the unassisted eye they are not distinguishable from the sterile and tetrasporic specimens, but they differ in the smallness of the cortical cells, which by repeated cell-divisions in radial direction become smaller and smaller until the antheridia are fully developed. In section the antheridial layer is more translucent than the rest of the cortical tissue. Viewed from above the antheridia are closely crowded; they are supported by regularly shaped, elongated cells. The antheridial layer covers a great deal of the surface of the plant in irregularly formed spots of varying extent. I have not seen the pollinoids. The antheridia of *H. r.* resemble exactly the antheridia of Rhodymenia palmata as designed by Thuret[1]) and Buffham[2]).

Fam. **Delesseriaceæ.**

Delesseria alata (Huds.) Lam., Strömf. Algveg. p. 24.

It grows in the lower litoral zone and in the upper sublitoral region to a depth of 10 fathoms. Not rare on the stems of Laminaria hyperborea. Collected with tetraspores in May—June and August. With cystocarps in May. 2—11 cm. high and the frond 1—4 mm. broad.

SW. Icel. Hjallasandur, Einarslón; Reykjavík (Grønlund; C. O.).
S. Icel. Eyrarbakki, Vestmannaeyjar.

Delesseria Baerii (Post. et Rupr.) J. Ag.
* **corymbosa** (J. Ag.) K. Rosenv. Grl. Havalg. p. 806.

In the herbarium of the Botanical Museum in Copenhagen is one specimen of this plant. On the label is written: Islandia d. [ɔ: dedit] Mørck.

The collector of this plant is probably Mr. Mørck, who travelled in Iceland 1821. This plant must belong to the arctic area of the Icelandic Seas.

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[1]) G. Thuret: Recherches sur la fécondation des Fucacées et les anthéridies des Algues. Ann. d. sciences naturelles, Tom. III, Paris 1855.

[2]) Th. Buffham: On the antheridia, etc. of some Florideæ, in the Journal of the Quekett Microscopical Club 1893.

Delesseria sinuosa (Good. et Wood.) Lam., Strömf. Algveg. p. 24.

It grows in the sublitoral region, usually on other algæ, in a depth of 3—20 (usually 8—12) fathoms. Collected with tetraspores in May—June and September. The frond is 10—20 cm. high, the leaves 5—8 cm. long and 3—5,5 cm. broad. The form of the leaves is oblong or ovate, in young leaves obovate. The lobes of the leaf are of varying greatness and form, corresponding to the description of the f. *typica* and the f. *quercifolia*; I have seen many intermediate forms between these two formae, and they cannot be kept apart with distinct characters. Sometimes I have met with specimens bearing prolifications, in most cases loose lying specimens, which in all, except that they have the prolifications, agree with common forms of this species (f. *lingulata*).

Probably common round Iceland.
E. Icel. common.
N. Icel. Ásmundarstaðir (St.): Eyjafjörður: Skagafjörður (Strömfelt).
NW. Icel. and SW. Icel. common.
S. Icel. Eyrarbakki (Strömfelt); Westmannaeyjar.

Delesseria sanguinea (L.) Lam.; Hydrolapathum s. Strömf. Algveg. p. 26.

It grows in the sublitoral region in a depth of 3—10 fathoms, on Laminaria-stems, and in rock-pools at low-water-mark. Collected sterile in April—August, with cystocarps in November. The frond is 10—23 cm high. The leaves are 5—18 cm. long and 1,5—3,5 cm. broad.

Rather common in SW. Icel. and S. Icel.
E. Icel. Húsavík.
SW. Icel. Hvammsfjörður, Hjallasandur. Reykjavík (C. O.).
S. Icel. Staður (C. O.); Eyrarbakki, Vestmannaeyjar.

Fam. Bonnemaisoniaceæ.

Bonnemaisonia asparagoides (Wood.) C. Ag.

In the herbarium of the Botanical Museum in Copenhagen there are three specimens of this species, said to have been collected in Iceland. 1—6 cm. high.

On one of the labels is written: „misit Faber". In Fl. Dan. T. 2579 a specimen of this plant is given, regarding which Liebmann writes: „ad littora Islandiæ pr. Reykjavik legit beatus Faber, cujus specimina mecum communicavit cl. Hofman-Bang".

It is possible that this plant occurs in S. Icel since it is known so far north as Bergen (Norway)[1]) and also occurs in the Orkneys.

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[1]) According to informations kindly given to me in a letter by Mr. M. Foslei.

The collector, Frederik Faber, travelled in Iceland 1819—1821; he dwelt a winter (1820—1821) at Eyrarbakki in S. Icel., and possibly his specimina of this plant were collected here.

Fam. **Rhodomelaceæ.**

Polysiphonia parasitica (Huds.) Grev., Kjellm. The Algæ of the Arctic Sea p. 117.

In the sublitoral region on the fibers of Laminaria hyperborea, in a depth of 10 fathoms. Collected with cystocarps and tetraspores in May. 1.5 cm. high.

S. Icel. Vestmannaeyjar.

Polysiphonia urceolata (Lightf.) Grev., Strömf. Algveg. p. 24.

It grows abundantly and gregarious on stones and other algæ in the lower litoral zone, and in the sublitoral region to a depth of 10 fathoms in most cases on Laminaria-stems. Collected with cystocarps in May and July, with antherida in June, and tetraspores in May—July. It occurs with hairs in March—August, but specimens without hairs also occur (in Jan.—Febr. and June—July).

Probably common round Iceland.

E. Icel. Reyðarfjörður, Seyðisfjörður.
N. Icel. Grímsey (O. D.); Eyjafjörður.
NW. Icel. and SW. Icel. common.
S. Icel. Eyrarbakki, Vestmannaeyjar.

Polysiphonia Brodiæi (Dillw.) Grev.

In the herbarium of the Botanical Museum in Copenhagen there is one specimen of this plant, said to have been collected in Iceland, but as both the collector and the finding-place are unknown I mention it here with doubt. On the label is written in Schousboe's handwriting: Ex. Islandia.

Polysiphonia elongata (Huds.) Harv.

In the herbarium of the botanical Museum in Copenhagen there is one specimen of this plant, said to have been collected in Iceland, but as neither the collector nor the finding-place is known, I mention it here as a doubtful Icelandic plant. On the label is written in Schousboe's handwriting: Ex. Islandia.

Polysiphonia fastigiata (Roth) Grev., Strömf. Algveg. p. 24.

In the litoral zone, as usually, on Ascophyllum nodosum. Collected with antheridia in May, with cystocarps and tetraspores in July—August. 3,5 cm. high.

NW. Icel. Ísafjörður (C. O.; G. Guðmundsson).
SW. Icel. Common.
S. Icel. Eyrarbakki (Strömfelt); Vestmannaeyjar.

Polysiphonia arctica J. Ag., Rosenv., Grl. Havalg. p. 800.

In the sublitoral region in a depth of 2—30 (usually 7—12) fathoms. In August I met with few specimens with tetraspores. The number of the pericentral cells I have found varying from 4 to 7, but usually they are 6—7, sometimes 5—7 (cfr. Rosenv. l. c.). 20—30 cm. high.

E. Icel. Common.
N. Icel. Probably common. Eyjafjörður; Skagafjörður (Grønlund).
NW. Icel. Common.
SW. Icel. Stykkishólmur.

Polysiphonia nigrescens (Huds.) Harv., Kjellm., The Algæ of the Arctic Sea p. 126.

In rock-pools in the lower litoral zone. Collected in July—Sept., with cystocarps in September. 6—8 cm. high.

NW. Icel. Skálholtsvík.
SW. Icel. Melar, Ólafsvík.

Rhodomela lycopodioides (L.) Ag., Strömf., Algveg. p. 23.

It grows in the lower litoral zone and in the sublitoral region to a depth of c. 10 fathoms. Collected with cystocarps in March—Sept., with tetraspores in April—Sept. Specimens collected in December and January are sterile. Specimens collected in the autumn consist of the main-axis without the branches and are of the same appearance as designed in the Fl. dan. T. 357. Specimens collected in the spring (April—May) have the elongated branches richly developed. It occurs with hairs in March—Sept., but in Aug—Sept. specimens without hairs are not rare. 6—17 cm. high.

Following forms of the *R. lycopodioides* occur:

f. *compacta* Kjellm.

f. *laxa* Kjellm.

f. *tenera* Kjellm.

The f. *laxa* is the most common. Strömfelt further mentions the f. *Cladostephus* (J. Ag.) Kjellm., but I think that Strömfelt's f. *cladostephus* is referable to Kjellmans f. *laxa*.

Probably common round Iceland.

E. Icel., N. Icel., NW. Icel. and SW. Icel. common.
S. Icel. Eyrarbakki, Vestmannaeyjar.

Odonthalia dentata (L.) Lyngb., Strömf., Algveg. p. 23.

In the sublitoral region in a depth of 2—20 (usually 3—10) fathoms. Small specimens, 2—4 cm. high, occur in the litoral zone in rock-pools. Collected with tetraspores in January, June and Sept.—Octob.

Probably common round Iceland.

E. Icel. Common.
N. Icel. Ásmundarstaðir (St.); Eyjafjörður.
NW. Icel. and SW. Icel. Common.
S. Icel. Eyrarbakki.

Fam. **Ceramiaceæ.**

Callithamnion Arbuscula (Dillw.) Lyngb., Strömf., Algveg. p. 32.

It grows in the lower litoral zone attached to stones or other algæ (common on Gigartina), and also occurs on Cladophora rupestris. Collected with tetraspores in May—July, with cystocarps and antheridia in June. 3—4 cm. high.

Rather common in SW. Icel. and S. Icel.

SW. Icel. Öndverðarnes; Njarðvík (C. O.).
S. Icel. The southern shore of Reykjanes (C. O.); Eyrarbakki, Vestmannaeyjar.

Callithamnion scopulorum C. Ag., Spec. Alg. p. 176.

In the litoral region, on stones and various algæ as Gigartina, Cystoclonium, Cladophora rupestris a. o. With tetraspores in May—July.

SW. Icel. Öndverðarnes, Einarslón; Reykjavík (C. O.).
S. Icel. Vestmannaeyjar.

Plumaria elegans (Bonnem.) Schmitz, Syst. Uebersicht der bisher bekannten Gattungen der Florideen. Flora oder allgem. bot. Zeitung 1889; Kjellman: The Algæ of the Arctic Sea p. 172.

It grows in the lower litoral zone; with cystocarps in May, tetraspores in June, August and October. 7—10 cm. high.

Probably common in SW. and S. Icel.

SW. Icel. Hrappsey, Stykkishólmur; Reykjavík (C. O.).
S. Icel. Melvík (C. O.); Eyrarbakki, Vestmannaeyjar.

Ptilota plumosa (L.) Ag., Strömf., Algveg. p. 32.

In the sublitoral region in a depth of 1—20 (usually 3—10) fathoms. With tetraspores in May—Sept. and cystocarps in May—June. 4—18 (usually 10—18) cm. high.

N. Icel. Ásmundarstaðir (St.); Grímsey (O. D.); Eyjafjörður.
NW. Icel. and SW. Icel. Common.
S. Icel. Probably common. Staður (C. O.); Eyrarbakki, Vestmannaeyjar.

Ptilota pectinata (Gunn.) Kjellm., Strömf., Algveg. p. 32.

In the sublitoral region to a depth of c. 10 fathoms, and in the litoral zone at low-water-mark. 2—8 cm. high.

E. Icel. Common.
N. Icel. Probably common. Ásmundarstaðir (St.); Eyjafjörður; Skagafjörður (Grønlund).
NW. Icel. Common.
SW. Icel. Hvammsfjörður, Reykjavík.

Antithamnion Plumula (Ellis) Thur., *β* **boreale** Gobi, A. boreale Strömf., Algveg. p. 32.

It grows in the sublitoral region to a depth of c. 12 fathoms. With tetraspores in June. It occurs both with and without glandular cells.

E. Icel. Seyðisfjörður (C. O.).
N. Icel. Grjótnes (C. O.); Skagafjörður (Strömfelt).
NW. Icel. Dýrafjörður (C. O.).
SW. Icel. Hvammsfjörður.

Antithamnion floccosum (Müll.) Kleen., Strömf., Algveg. p. 32.

In the litoral zone at low-water-mark and in the sublitoral region to a depth of 5 fathoms. With tetraspores in April—June. Without glandular cells.

E. Icel. Eskifjörður (Strömfelt).
SW. Icel. Hvammsfjörður, Viðey, Reykjavík.
S. Icel. Eyrarbakki, Vestmannaeyjar.

Ceramium rubrum (Huds.) Ag., Strömf., Algveg. p. 31.

It grows in the lower litoral zone and in the sublitoral region to a depth of c. 12 fathoms. Collected with tetraspores in May—Sept. and with cystocarps in June—Sept. 8—16 cm. high.

Following forms of this varying species occur:

f. *decurrens* J. Ag.

f. *genuinum* Kjellm.

f. *prolifera* J. Ag.

The f. *decurrens* is the most common.

Probably common round Iceland.

N. Icel. Eyjafjörður.
NW. Icel. and SW. Icel. Common.
S. Icel. Staður (C. O.); Eyrarbakki, Vestmannaeyjar.

Ceramium acanthonotum Carm., Kjellman, The Algæ of the Arctic Sea p. 171.

It grows in the litoral zone attached to other Algæ. All the Icelandic specimens belong to the f. *typica* Kjellm. (l. c.). 1—3 cm. high.

SW. Icel. Öndverðarnes.
S. Icel. Melvík (C. O.); Vestmannaeyjar.

Rhodochorton Rothii (Turt.) Naeg., Rosenv., Grl. Havalg. p. 791.

It is very abundant and gregarious on stones in the litoral region and forms an undervegetation in the Fucus-zone. It occurs also in the sublitoral region on the stems of Laminaria hyperborea to a depth of c. 10 fathoms.

The litoral specimens collected in March—October are always sterile with exception of few specimina collected in July at Grjótnes in N. Icel. The sublitoral specimens collected in the summer, in July, at Vattarnes in E. Icel., in a depth of 10 fathoms, growing between the fibers of Laminaria hyperborea, are with tetraspores. The specimens growing on the old stems of Lam. hyperborea collected in the spring, in March—April, at Reykjavík, are also with tetraspores.

In the literature I have only seen fructiferous summer-specimens of R. Rothii mentioned by Kjellman [1]), collected by him at Spitzbergen in July.

The litoral, sterile specimens are usually c. 5 mm. high and the fructiferous specimens collected at Grjótnes 13 mm. high. The thickness of the filaments are 10—18 μ, and the cells are 1—5 times longer than broad.

At Vestmannaeyjar it formed on very exposed rocks in the litoral zone almost globular, solid tufts, with the basal filaments densely intertwisted, the f. *globosa* Kjellm. (The Algæ of the Arctic Sea). Lyngbye [2]) mentions similar forms of the R. Rothii and utters thereabout: „interdum ad latera rupium glomerulos durissimos formantes".

The branches of the specimens collected at Grjótnes have, instead of one, one to three bunches of fructiferous branchlets. Either the branches have one or a few bunches in different heighth, or the branchlets after the extrusion of the spores grow long and bear one to three bunches of fructiferous branchlets [3]). These specimens are considerably higher than the common, sterile Icelandic specimens, and resemble somewhat the *R. intermedium* Kjellm. (Spetsbergens Thallophyter p. 28 (l. c.)), but as they generally very well agree with R. Rothii, I refer them to it without hesitation. The R. intermedium is very closely related to R. Rothii and is probably not specifically distinct from it, differing only by the heighth of the vertical filaments (2—3 cm.); all the other characters mentioned in Kjellman's description of R. intermedium (l. c.) agree as well with R. Rothii as with R. intermedium.

[1]) F. R. Kjellman: Om Spetsbergens marina, klorofyllförande Thallophyter. Bihang till K. svenska Vet. Akad. Handlingar. Band 3. Stockholm 1875.

[2]) H. B. Lyngbye: Tentamen Hydrophytologiæ Daniæ. Hafniæ 1819, p. 129.

[3]) Somewhat similar specimens are mentioned by K. Rosenvinge in Grl. Havalger (l. c.).

The specimens growing on the old stems of Laminaria hyperborea resemble the R. Rothii in everything, except that the basal filaments are creeping in the subepidermal tissue of the Laminaria stems. At first I thought that the plant was an endophyte, but by further examination of the Laminaria tissue, I am convinced, that it is only a pseudo-endophyte. The surface of the Laminaria stems was rough, the epidermal layer had fallen away, the intercellular substance of the subepidermal tissue was disorganized, and the cell-rows in many cases split. The basal filaments of the Rhodochorton were creeping in the dead tissue, but the death of the tissue did not seem to have been caused by it. Sometimes it is difficult to see whether the Rhodochorton has caused the destruction of the tissue, or not, but several times it is easily seen, that the tissues were dead when the Rhodochorton appeared. The Polysiphonia urceolata, which grew among the Rhodochorton on the Laminaria stems in the dead tissue, was a „pseudo-endophyte", in the same manner as the R. Rothii.

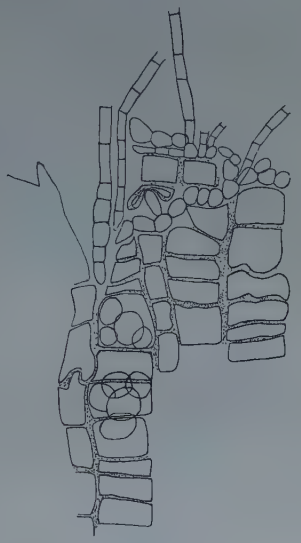


Fig. 3. *Rhodochorton Rothii.* Transverse section of part of the stem of Laminaria hyperborea showing the Rhodochorton filaments creeping in the dead and dying tissues (138 : 1).

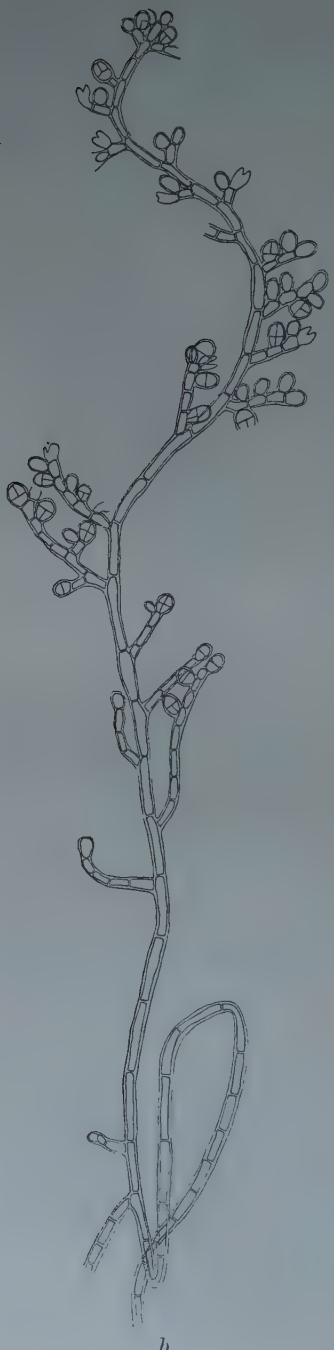
The *R. parasiticum* Batters [1]) is certainly identical with the R. Rothii growing in the dead tissue of the Laminaria stems.

E. Icel. Vattarnes.
N. Icel. Grjótnes (C. O.).
NW. Icel. Dýrafjörður (C. O.).
SW. Icel. Probably common. Ólafsvík, Brimnes, Reykjavík, Hafnarfjörður.
S. Icel. Vestmannaeyjar.

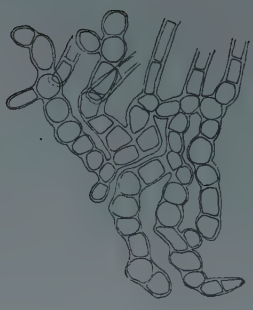
Rhodochorton repens H. Jónsson nov. sp.

Planta epiphytica c. 1 mm. alta, filis erectis 8—13 μ crassis e basi a filis repentibus constituto egredientibus, inferiore parte nudis, superiore autem circiter a medio ramosis. Rami sparsi, alterni, sæpe secundi (præsertim rami superiores), interdum oppositi, et in supremo axi primario corymbosi, sporangia gerentes. Rami (ramuli) infimi et supremi breves, medii autem interdum elongati. Sporangia

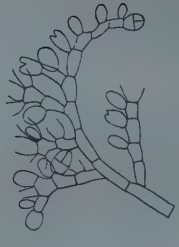
[1]) E. A. Batters: New or critical British marine Algæ. Journal of Botany. Vol. 34. London 1896



b.



a.



c.

Fig. 4. *Rhodochorton repens.*

a. The creeping basal filaments and the lowest part of 5 erect filaments (384 : 1). — *b.* An erect filament with branches and sporangia (138 : 1). — *c.* Uppermost part of an erect filament with secund, corymbous branches (138 : 1).

in supremo axi primario et in ramulis sessilia aut breve pedicellata, sæpissime in axi primario et in superiore latere ramulorum secunda, rarius opposita et in ultima cellula terminalia, ovata, obovata aut ellipsoidea, 20—27 μ longa et 14—17 μ lata.

In stipite Alariæ esculentæ.

The length of the cells in the primary axis below and above is 2—3 times and in the middle 5 times larger than their breadth. The upper ends of the cells, especially in the branches, are broader than the lower ends.

The cells in the creeping, basal filaments are usually as long as they are broad, and often rounded. The colour of this plant I cannot describe, as I have only got it preserved in alcohol, and on account of its bad condition I am not sure of the shape of the chromatophore, but it seems to be one parietal plate.

Collected with tetraspores in May.

S. Icel. Vestmannaeyjar.

Rhodochorton minutum Suhr. Descr. in Reinke's Atlas. Fig. Reinke's Atlas T. 40.

It grows in the litoral region on Cystoclonium purpurascens. Collected with tetraspores in June.

SW. Icel. Njarðvík (C. O.).

Rhodochorton penicilliforme (Kjellm.) Rosenv., Les Algues marines du Groenland in Ann. Sc. nat. 7e Sér. XIX.

It grows on Sertularia sp. on Fucus in the litoral zone and on Laminaria in the sublitoral region. Collected with tetraspores in March—August. The thickness of the vertical filaments is 11—13 μ.

E. Icel. Berufjörður, Reyðarfjörður.
N. Icel. Hrísey.
NW. Icel. Ísafjörður; Dýrafjörður (C. O.).
SW. Icel. Hvammsfjörður, Stykkishólmur, Reykjavík.

Rhodochorton membranaceum Magnus. Rosenv., Grl. Havalg. p. 794, P. Kuckuck: Beiträge zur Kenntniss der Meeresalgen 1897.

It grows together with the last species in Sertularia on Fucus in the litoral region and on Laminaria in the sublitoral region. Collected with tetraspores in March—August. The vertical filaments are 7—8 μ thick. This species is easily distinguished from the R. penicilliforme, being both considerably narrover and endozoic.

Probably common round Iceland.

E. Icel. Berufjörður, Reyðarfjörður.

N. Icel. Hrísey.
NW. Icel. Ísafjörður; Dýrafjörður (C. O.).
SW. Icel. Hvammsfjörður, Stykkishólmur, Reykjavík.

Fam. **Dumontiaceæ.**

Dumontia filiformis (Fl. dan.) Grev., Strömf. Algveg. p. 30.

It grows in rock-pools in the litoral region both on sheltered and exposed coast. Collected with tetraspores in May—June, with antheridia in May and with cystocarps in June. 12—24 cm. high, and the branches 1—2 mm. broad.

E. Icel. Hólmar in Reyðarfjörður.
SW. Icel. rather common. Stykkishólmur, Ólafsvík, Reykjavík; Njarðvík (C. O.).
S. Icel. Eyrarbakki, Vestmannaeyjar.

Dilsea edulis Stackh., *Sarcophyllis edulis* Kjellman, The Algæ of the Arctic Sea p. 152.

It is only known from one place, where it was growing in the Fucus-zone in the litoral region. 2—5,5 cm. high and 1—2,5 cm. broad.

SW. Icel. Öndverðarnes.

Fam. **Nemastomaceæ.**

Furcellaria fastigiata (Huds.) Lam.

One specimen of this plant is in the herbarium of the Botanical Museum in Copenhagen. On the label is written in Schousboe's handwriting: Ex Islandia.

As neither the collector nor the finding-place is known, this species must be mentioned as a doubtful Icelandic plant.

Fam. **Squamariaceæ.**

Petrocelis Hennedyi (Harv.), Batters, A list of the marine Algæ of Berwick-on-Tweed.

It forms rather great crusts on the stems of Laminaria hyperborea. Collected with tetraspores in January and July—October. In this species *Codiolum Petrocelidis* Kuckuck is a frequent endophyte.

NW. Icel. Ísafjörður (C. O.).
SW. Icel. Melar, Skógarnes, Reykjavík, Seltjarnarnes.
S. Icel. Eyrarbakki.

Cruoria arctica Schmitz in Rosenv., Grl. Havalg. p. 784.

It grows in the sublitoral region to a depth of c. 10 fathoms, and at low-water-mark in the Corallina-zone. Collected with tetraspores in June—July.

SW. Icel. Stykkishólmur, Brimnes; Keflavík by Snæfellsjökull (C. O.).

Cruoria pellita (Lyngb.) Fries., Kjellm., The Algæ of the Arctic Sea p. 142.

In the litoral zone.

SW. Icel. Njarðvík (C. O.).

Peyssonellia Rosenvingii Schmitz in Rosenv., Grl. Havalg. p. 782; Hæmatostagon balanicola Strömf., Algveg. p. 25 (?).

On the fibers of Laminaria hyperborea, different shells, and stones to a depth of c. 15 fathoms. Collected in April—Sept., only sterile.

The Icelandic specimens closely resemble the Greenlandic specimens of P. Rosenvingii, and although the Icelandic plants are sterile, I refer them withouth hesitation to this species.

The *Hæmatostagon balanicola* is described by Strömfelt (1887) as novi generis nova species: his description is founded on young and sterile specimens collected in Skagafjörður in N. Icel. He shows in the description that this new genus is closely related to the genus *Peyssonellia*, but differing from it by the absence of the radicles.

Strömfelt's description is too defective, but later it has been completed by M. Foslie[1]) and Fr. Schmitz[2]), who have both had opportunity to examine Strömfelt's original specimens. They both found that Strömfelt had not noticed the radicles, and consequently they identify the genus Hæmatostagon with the genus Peyssonellia.

Foslie identifies (1894, l. c.) the H. balanicola Strömf. with the P. Rosenvingii Schmitz (described in 1893), but in the same year (1894), somewhat later, Fr. Schmitz (l. c.) in his answer to M. Foslie, mentions the H. balanicola. In the year 1887 he had received an original specimen of this plant from Strömfelt. Having examined it, he found that it was furnished with radicles, and consequently he thought he could identify Hæmatostagon with Peyssonellia[3]); this he communicated to Strömfelt and received his consenting answer in a letter of 1. March 1887. Schmitz did not admit that H. balanicola was identical with P. Rosenvingii. „*H. balanicola* Strömf.", he says, „ist eine ganz unbestimmbare Squamariacee. .... Es handelt sich hier um jugendliche Exemplare einer Alge, die jungen

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[1]) M. Foslie: New or critical Norwegian Algæ. Det kongelige Norske Videnskabers Selskabs Skrifter 1893. Throndhjem 1894.

[2]) Fr. Schmitz: Kleinere Beiträge zur Kenntniss der Florideen. La Nuova Notarisia 1894.

[3]) In Fr. Schmitz: Systematische Uebersicht der bisher bekannten Gattungen der Florideen, in Flora oder allg. bot. Zeitung 1899 and in Engler und Prantl: Die natürlichen Pflanzenfamilien the genus Hæmatostagon is mentioned as identical with the genus Cruoriella.

Pflanzen von *Peyssonellia Rosenvingii*, wie ich zugebe, ähnlich sind, die ebensogut aber auch ganz anderen Arten von *Peyssonellia* .... zugehören können".

In Remark on the *Hæmatostogon balanicola* Strömf.[1]) Foslie in his answer to Schmitz says: „I admit, that I ought not to have adopted Strömfelt's denomination until better developed specimens of this species are forthcoming, but on the other hand I think, that also the latter [ɔ: *H. balanicola*] will prove to be identical with the Greenlandic specimen."

This is all that is known about the Hæmatostagon balanicola. I have not seen Strömfelt's original specimen and cannot add to the knowledge about this plant, but I think, that Foslie is right in identifying it with P. Rosenvingii. Schmitz's objections do not demonstrate, that H. balanicola is specifically different from P. Rosenvingii; he admits, on the contrary, that the former resembles young specimens of the latter. He only says that the young, sterile specimens of H. balanicola are, as other young and sterile Squamariaceæ, indeterminable, and consequently cannot with certainty be identified with any of the known species of Peyssonellia, but he adds: „Wenn einmal genau festgestellt sein wird, welche Arten der Squamariaceen überhaupt an der Nordküste von Island vorkommen, dann mag es vielleicht möglich sein, mit ziemlicher Wahrscheinlichkeit, oder selbst mit Sicherheit anzugeben, zu welcher Species die jugendlich unentwickelten und sterilen Exemplaren, die Strömfelt vorlagen, gehörten."

Although we, at present, do not exactly know the distribution of the Squamariaceæ round Iceland, I think that we know enough to say, that it is a probability almost amounting to certainty, that the plant collected by Strömfelt in N. Icel. and by him named H. balanicola is identical with P. Rosenvingii, which is not rare in N. Icel. and E. Icel.

E. Icel. Berufjörður, Seyðisfjörður.
N. Icel. Grjótnes (C. O.); Hrísey; Skagafjörður (Strömfelt).
NW. Icel. Hrútafjörður, Bíldudalur.
SW. Icel. Stykkishólmur; Keflavík by Snæfellsjøkull (C. O.); Reykjavík.

Rhododermis parasitica Batters, A List of the marine Algæ of Berwick-on-Tweed.

On the stems of Laminaria hyperborea and different shells. With tetraspores in April—July.

NW. Icel. Ísafjörður (C. O.).
SW. Icel. Einarslón, Engey.
S. Icel. Eyrarbakki.

[1]) La nuova Notarisia 1896.

Fam. Corallinaceæ.

Lithothamnion [1]) **glaciale** Kjellm., Strömf., Algveg. p. 18.

In a depth of 1—10 fathoms. One specimen resting in the Botanical Museum in Copenhagen is said to have been dredged up in a depth of 80 fathoms near Grímsey (legit Sölling).

E. Icel. Berufjörður (Johansen); Reyðarfjörður, Seyðisfjörður.
N. Icel. Grímsey (O. D.); Eyjafjörður; Skagaströnd (Johansen).
S W. Icel. Gustsey, Stykkishólmur; Keflavík by Snæfellsjökull (C. O.); Reykjavík.

Lithothamnion Ungeri Kjellm., the Algæ of the Arctic Sea p. 91 excl. syn.; L. intermedium Strömf., Algveg. p. 19.

Abundant in a depth of 10 fathoms in quiet water.

E. Icel. Seyðisfjörður.
N. Icel. Eyjafjörður (St.).
NW. Icel. Bildudalur.

Lithothamnion tophiforme Unger, Foslie, The Norwegian Forms of Lithothamnion 1895, p. 119; L. soriferum Strömf., Algveg. p. 18.

In a depth of 5—30 fathoms.

E. Icel. Reyðarfjörður; Eskifjörður (Strömfelt); Norðfjörður (Hörring).
N. Icel. Húsavík (Strömfelt); Eyjafjörður.
S. Icel. Eyrarbakki (Strömfelt). One specimen is also said to have been collected south of Iceland (dedit Brusendorff).

Lithothamnion flavescens Kjellm., The Algæ of the Arctic Sea p. 98.

In a depth of 8—18 fathoms.

E. Icel. Reyðarfjörður, Seyðisfjörður.

Lithothamnion foecundum Kjellm., The Algæ of the Arctic Sea p. 99.

In a depth of 10 fathoms.

E. Icel. Reyðarfjörður, Seyðisfjörður.
N. Icel. Eyjafjörður.

Lithothamnion læve (Strömf.) Fosl., List of species of Lithothamnia; Lithophyllum læve Strömf., Algveg. p. 21.

At low-water-mark and in a depth of 1—20 fathoms.

E. Icel. Reyðarfjörður.
N. Icel. Eyjafjörður; in 66° 33′ N. Lat., 20° 06′ W. Long, in a depth of 44 fathoms (C. O.).

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[1]) The genera *Lithothamnion, Phymatolithon, Clathromorphum, Lithophyllum* and *Dermatolithon* have been determined by M. Foslie.

NW. Icel. Ísafjörður; Dýrafjörður (Ldbk., C. O.); Tálknafjörður (Ldbk.).
SW. Icel. Reykjavík.
S. Icel. Eyrarbakki (Strömf.).

Lithothamnion Lenormandi (Aresch.) Fosl., The Norwegian Forms of Lithothamnion 1895, p. 150.

In a depth of 1—2 fathoms.

SW. Icel. Reykjavík.

Phymatolithon polymorphum (L.) Fosl., List of Species of the Lithothamnia p. 8; Lithothamnion polymorphum Strömf., Algveg. p. 19.

In the litoral region at low-water-mark.

S. Icel. Eyrarbakki, Vestmannaeyjar.

Clathromorphum compactum (Kjellm.) Foslie, List of Species of the Lithothamnia p. 8; Lithothamnion compactum Kjellm., The Algæ of the Arctic Sea p. 101.

In a depth of 1—18 fathoms.

E. Icel. Reyðarfjörður, Seyðisfjörður.
N. Icel. Grjótnes (C. O.); Eyjafjörður.
NW. Icel. Hrútafjörður, Ísafjörður.
SW. Icel. Reykjavík (C. O.).
S. Icel. Eyrarbakki.

Clathromorphum circumscriptum (Strömf.) Fosl., List of Species of Lithothamnia p. 8; Lithothamnion circumscriptum Strömf., Algveg. p. 20.

In the lower litoral zone and upper sublitoral region to a depth of c. 5 fathoms, on stones and the fibers of *Laminaria*.

E. Icel. common. Berufjörður, Reyðarfjörður, Seyðisfjörður.
N. Icel. Eyjafjörður (O. D., St.); Hraun i Fljót (G. Davíðsson).
NW. Icel. Ísafjörður; Tálknafjörður (Ldbk.); Arnarfjörður.
SW. Icel. Melar, Reykjavík.

Lithophyllum Crouani Fosl., List of Species of the Lithothamnia, p. 10.

Only known from two places in a depth of 5—7 fathoms on Laminaria hyperborea, both on the stem, which was nearly totally covered by it (at Hrísey), and on the fibers.

N. Icel. Hrísey.
NW. Icel. Dýrafjörður (C. O.).

Dermatolithon macrocarpum (Ros.) Fosl., Revised systematical survey of the Melobesieæ p. 21; Melobesia macrocarpa Strömf., Algveg.

On the fibers and stems of Laminaria hyperborea. With tetraspores and cystocarps in April—June.

Mr. Foslie thinks that D. macrocarpum and D. Laminariæ probably are identical.

SW. Icel. Reykjavík.
S. Icel. Eyrarbakki, Vestmannaeyjar.

Corallina officinalis L., Strömf., Algveg. p. 18.

In the lower litoral zone in rock-pools and in the sublitoral region to a depth of c. 10 fathoms. With antheridia in June—July and tetrasporangia in August.

N. Icel. Hjeðinshöfði (O. D.); Eyjafjörður.
NW. Icel. Látravík, Adalvík (Ldbk.); Ísafjörður, Arnarfjörður.
SW. Icel. Common.
S. Icel. Eyrarbakki, Vestmannaeyjar.

Hildenbrandia rosea Kütz.; Hildenbrandtia r. Strömf., Algveg. p. 24.

It grows abundantly and gregariously in the litoral region as undervegetation in the Fucus-zone; and occurs also in the sublitoral region to a depth of 2 fathoms. With tetraspores in May—Sept.

Probably common round Iceland.

E. Icel. Reyðarfjörður, Seyðisfjörður.
N. Icel. Grímsey (O. D.); Eyjafjörður.
NW. Icel. Hrútafjörður; Dýrafjörður (C. O.).
SW. Icel. Common.
S. Icel. Vestmannaeyjar.

Flora of Koh Chang.

Contributions to the knowledge of the vegetation in the Gulf of Siam.

By

Johs. Schmidt.

Part IV.

(**W. West** and **G. S. West**: Fresh Water Chlorophyceae. — **Th. Reinbold**: Marine Algae (Chlorophyceae, Phaeophyceae, Dictyotales, Rhodophyceae)[1]). — **M. Gomont**: Myxophyceae hormogoneae. — **Johs. Schmidt**: Peridiniales.)

Fresh Water Chlorophyceæ

by **W. West** F. L. S. and Prof. **G. S. West** B. A. — Bradford.

(With plate 2—4).

The following contribution to the flora of the island of Koh Chang has resulted from the examination of a number of collections of freshwater *Chlorophyceæ* made during the stay of the Danish Expedition in Siam in 1899—1900. The collections were preserved in weak alcohol or formaline and were twenty four in number.

Very few filamentous *Chlorophyceæ* were obtained, the chief of which were four species of *Œdogonium* and four of *Spirogyra,* one species of each of these genera being quite new. Two of the collections from stagnant water in the jungle were rich in various free-swimming *Palmellaceæ.* Some four or five of the collections contained a number of Desmids, many of which have proved to be very interesting.

The only papers dealing with freshwater Algæ from this region of the world are: — Joshua on „Burmese Desmids" (1886);

[1]) Excl. *Corallinaceae* by M. Foslie, published in part II. of the Flora of Koh Chang.

Schmidle on „Einige Algen aus Sumatra“ (1895); W. West & G. S. West on „Desmids from Singapore“ (1897); and a note by Archer in Quart. Journ. Micr. Sci. (1865) on two Desmids from Hong Kong. To these may be added a paper by Lütkemüller on „Desmidiaceen aus den Ningpo-Mountains in Centralchina“ (1900).

The following is a summary of the Chlorophyceæ observed:

	Genera	Species
Coleochætaceæ	1	1
Œdogoniaceæ	1	4
Confervaceæ	1	1
Ophiocytieæ	1	2
Zygnemaceæ	1	4
Desmidiaceæ	11	84
Palmellaceæ	14	25
Total	30	121

Of the above, 9 species and a number of varieties are here described for the first time.

In addition to the above several sterile species of Spirogyra, Zygnema, Mougeotia, Bulbochæte, and Œdogonium were observed, and also a few fragments of a species of Chaetophora.

Class. Chlorophyceæ.

Ord. *Confervoideæ Heterogamæ.*

Fam. Coleochætaceæ.

Aphanochæte Berth.

1. **A. repens** Berth. 1878; De Toni Syll. Algarum, I, p. 179.

Diam. cell. 7,7—17 μ; altit. cell. 8,5—10 μ.

Attached to aquatic plants in stagnant water.

Area: Europe, North America, Sandwich Is., New Zealand.

Fam. Œdogoniaceæ.

Œdogonium Link.

2. **Œ. cryptoporum** Wittr. in Öfvers. af K. Vet.-Akad. Förh. 1870, no. 3, p. 119; in Nova Acta Reg. Soc. Scient. Upsala, ser. 3, IX, 1874, p. 7.

Var. **vulgare** Wittr. in Nov. Acta Reg. Soc. Scient. Upsala, l. c.

Crass. cell. veget. 5—7,5 μ; altit. 3—5-plo major;
„ oogon. 19—20 μ; „ 18—23 μ;
„ oospor. 17,5—18,5 μ; „ 13—14 μ.

In stagnant water in riverbed.
Area: Europe, N. America and New Zealand.

3. **Œ. maximum** West & G. S. West, n. sp. (Tab. nostr. IV, fig. 39—41.)

Œ. dioicum, macrandrium; oogoniis singulis, subquadratis vel oblongo-rectangularibus, levissime tumidis; oosporis oogonia exacte complentibus, subquadratis vel oblongo-rectangularibus, in sectione optica verticali circularibus; membrana oosporæ crassa, glabra, quasi crassescione membranæ oogonii formata; plantis masculis eadem crassitudine ac femineis; antheridiis pluricellularibus (?).

Crass. cell. veget. 89—93 μ; altit. $1^1/_2$—2 (usque ad 3)-plo major;
„ oogon. (et oospor.) 105—107 μ; altit. 115—136 μ;
„ cell. antherid. 77—86 μ; altit. 7—15 μ.

A large quantity of this *Œdogonium* was seen from stagnant water and the plants were in abundant fruit. The oospores are rather remarkable being somewhat rectangular in outline, and having a wall which is apparently formed by an increase in thickness of the wall of the oogonium. Thus, when the spore is ripe there is no differentiation between the oospore and the oogonium, and the ripe oospores are set free by the breaking up of the filaments. Only one example of the antheridia was observed and this was only a fragment. From its general appearance it is highly probable that the antheridia are many-celled, but this point could not be definitely determined.

It may be compared with *Œ. fabulosum* Hirn from which it is easily distinguished by its larger size and its differently shaped oospores, which completely fill the oogonia.

4. **Œ. dioicum** Carter in Ann. Mag. Nat. Hist. I, no. 4, 1858, p. 30, t. III, f. 1, 2, 5—8, 13—16; Hirn in Acta Soc. Scient. Fennicæ, Tom. XXVII, no. 1, 190, p. 175, t. XXVIII, f. 163. (Tab. nostr. IV, fig. 42.)

Crass. cell. veget. 31—35 μ; altit. 3—5-plo major;
„ oogon. 97 μ; „ 100 μ;
„ oospor. 70 μ; „ 70 μ.

We place this plant under *Œ. dioicum* Carter owing to the relative size of the filaments and the peculiar oogonia, which the oospores do not fill. It agrees with Carter's species in everything except the length of the cells, which are proportionately a little longer.

In stagnant water in the jungle, among the preceding species.
Area: India.

5. **Œ. pluviale** Nordst. in Rabenh. Alg. Europ. no. 2257; Wittr. in Acta Reg. Soc. Scient. Upsala, ser. 3, IX, p. 19; Hirn in Acta Soc. Scient. Fennicæ, tom. XXVII, no. 1, p. 280, t. XLVIII, f. 311.

Forma.

Crass. cell. veget. 19—25 μ; altit. $^3/_4$—2-plo major;
„ oogon. 40—46 μ; „ 44—48 μ;
„ oospor. 38—44 μ; „ 42—44 μ.

The form observed was from rocks in a riverbed and agrees with a form mentioned by Hirn (l. c. p. 281) as occuring in „Italia: in saxis humidis in Monte Fiesole prope oppidum Florenz". This form was previously described as '*Œ. Montagnei* F. Magz. var. *saxicolum* Wittr'.

Area: Europe and N. America.

Ord. *Confervoideæ Isogamæ.*

Fam. Confervaceæ.

Microspora Thur., em. Lagerh.

6. **M. abbreviata** Lagerh. in Bericht. Deutsch. Bot. Gesellsch. 1887, V, p. 417. *Conferva abbreviata* Rabenh. Krypt. Flor. v. Sachs. 1863, p. 246; Flor. Europ. Algar. III, p. 323.

Crass. fil. 10—11 μ.

In stagnant water amongst *Spirogyra decimina* var.
Area: Europe, N. America, Australia, and W. Africa.

Fam. Chaetophoraceæ.

Trentepohlia Mart.[1])

7. **T. aurea** Mart.

On rocks in the jungle near Klong Munsé, very common.
Area: Europe, America, Asia.

Fam. Ophiocytieæ.

Ophiocytium Näg.

8. **O. bicuspidatum** Lemmermann in Hedwigia 1899, Bd. XXXVIII, p. 31, t. III, f. 13—15. *O. majus* Näg. var. *bicuspidatum* Borge.

In muddy ricefield.
Area: Europe, and E. Africa (var.).

[1]) Auctore E. de Wildeman.

9. **O. parvulum** A. Braun Alg. Unicell. 1855, p. 55. *Brochidium parvulum* Perty 1852.

With the preceding species in muddy ricefield.

Area: Europe, N. America, Ceylon, Sumatra, Australia, and W. Africa.

Ord. *Conjugatæ.*

Fam. Zygnemaceæ.

Spirogyra Link.

10. **S. neglecta** Kütz. Spec. Algar. 1849, p. 441; Rabenh. Flor. Europ. Algar. III, p. 248; Petit Spirog. de Paris, p. 26, t. IX, f. 1—5. *Zygnema neglecta* Hass. 1845.

Crass. cell. veget. 65 μ; long. zygosp. 84—92 μ; lat. zygosp. 61—66 μ.

In stagnant water in riverbed.

Area: Europe and N. America, West Indies, Central and W. Africa (var. *ternata*). Ceylon.

11. **S. decimina** (Müll.) Kütz. Phyc. Germ. p. 223; Rabenh. Flor. Europ. Algar. III, p. 242; Petit Spirog. de Paris, 1880, p. 25, t. VIII, f. 1—3.

Forma major, cellulis vegetativis diametro $2^1/_2$—5 (usque 6)-plo longioribus; cellulis fructiferis non inflatis; chromatophoris 3 cum marginibus asperis, anfractibus $2^1/_2$—$4^1/_2$.

Crass. cell. veget. 46—50 μ; long. zygosp. 81—92 μ; lat. zygosp. 46—49 μ.

In stagnant water.

Area: Europe, N. America, Madagascar and Ceylon.

12. **S. Schmidtii** West & G. S. West, n. sp. (Tab. nostr. IV, fig. 43—45).

S. cellulis vegetativis diametro 7—10-plo longioribus, extremitatibus non replicatis; chromatophoris 2—3, angustis, laxis, cum marginibus leviter crenulatis et pyrenoidibus magnis, anfractibus $2^1{}_2$—4; conjugatione scalariformi, cellulis fructiferis inflatis; zygosporis elongato-ellipsoideis, diametro 2—$2^1{}_2$-plo longioribus, polis rotundatis vel conico-rotundatis; membrana zygosporæ maturæ crassa, lutea — brunnea, mesosporio scrobiculato.

Crass. cell. veget. 31—35 μ; crass. cell. fruct. 53—59 μ; long. zygosp. 88—118 μ; lat. zygosp. 44—46 μ.

It is perhaps nearest to *S. fluviatilis* Hilse but is distinguished by its less diameter, its longer cells, its fewer and different chromatophores, and by the form of its zygospores.

In stagnant water in riverbed among *S. neglecta* and *S. gracilis.*

13. **S. gracilis** Kütz. Spec. Algar. 1849, p. 438; Rabenh. Flor. Europ. Algar. III, p. 237; Petit Spirog. de Paris, 1880, p. 15, t. III, f. 7—8.

Forma cellulis paullo longioribus.

Crass. cell. veget. 17,5—19 μ; crass. cell. fruct. 27 μ; long. zygosp. 54—63 μ; lat. zygosp. 24—25 μ.

In stagnant water in riverbed.

Area: Europe and N, America. Abyssinia (var. *abyssinica* Lagerh.).

Fam. Desmidiaceæ.

Gonatozygon De Bary.

14. **G. Ralfsii** De Bary Conj. 1858, p. 76, t. IV, f. 23.

Long. 163—220 μ; lat. 11,5—13,5 μ.

In stagnant water amongst *Spirogyra decimina* var.

Area: N. and S. America, W. Indies, Europe, Siberia, China, India, Ceylon. Sumatra, E. and W. Africa, Australia.

15. **G. Kinahani** Rabenh. Flor. Europ. Algar. III, 1868, p. 156. *Leptocystinema Kinahani* Arch. 1858.

Var. **tropicum** West & G. S. West, n. var. (Tab. nostr. II, fig. 2).

Var. cellulis multo crassioribus.

Long. 336 μ; lat. 20—23 μ.

In stagnant water, amongst the preceding species.

Area of type: Europe.

Cylindrocystis Menegh.

16. **C. Brébissonii** Menegh. 1838; De Bary Conj. 1858, p. 35, 46, 74, t. VII, f. E 1—22. *Penium Brébissonii* Ralfs 1848.

Long. 53—78 μ; lat. 15—16,5 μ.

In stagnant water in riverbed.

Area: Ubiquitous.

17. **C. subpyramidata** West & G. S. West, n. sp. (Tab. nostr. II, fig. 8—11).

C. parva, pæne duplo longior quam lata; cellulis ellipticis, leviter et subgradatim constrictis ad medium; semicellulis ovato-pyramidatis, polis rotundo-subtruncatis; membrana glabra achroa; a vertice visis circularibus; pyrenoidibus singulis, magnis. Zygosporæ nigrescentes, oblongo-rectangulares angulis rotundatis, a latere visæ ellipticæ; in medio laterum membrana valde et subirregulariter incrassata.

Long. 27—28 μ; lat. 15—16 μ; lat. constrict. 14,5 μ; long. zygosp. 32,5—34 μ; lat. zygosp. 23—25 μ; crass. zygosp. 20 μ.

This species occured in small gelatinous masses amongst *Spirogyra gracilis* and *S. neglecta* in stagnant water in a riverbed.

It is nearest to *Cylindrocystis pyramidata* West & G. S. West recently found in Ceylon, but it is distinguished by its smaller size, its less tapering semicells, and its more open constriction.

Penium Bréb.

18. **P. Digitus** Bréb. in Ralfs Brit. Desm. p. 150, t. XXV, f. 3. *Closterium Digitus* Ehrenb. *Penium lamellosum* Kütz. *P. navigium* W. B. Turner.

Long. 188 μ; lat. 54 μ.

Among Utricularia in riverbed.

Area: Ubiquitous.

19. **P. australe** Racib. in Rospraw. Akad. Umiej. Krakow. Wydz. matem.-przy. ser. 2, vol. XXII, p. 367, t. VI, f. 27; West & G. S. West in Journ. Linn. Soc. bot. XXXIII, 1897, p. 157, t. VIII, f. 16.

Long. 80—75 μ; lat. 43—44 μ; lat. constrict. 41—42 μ.

In stagnant water in the jungle and in muddy ricefields.

Area: Singapore and Australia.

20. **P. cucurbitinum** Biss. in Journ. Roy. Micr. Soc. 1884, p. 197, t. V, f. 7.

Forma **minor** West in Journ. Roy. Micr. Soc. 1894, p. 4.

Long. 55,5 μ; lat. 52 μ.

In stagnant water with other Desmids.

Area: Europe. New Zealand (var.).

21. **P. curtum** Bréb. in Kütz. Spec. Algar. 1849, p. 167. *Closterium curtum* Bréb. 1840. *Cosmarium curtum* Ralfs 1848.

Forma **major** Wille in Öfvers. af K. Vet.-Akad. Förh. 1879, no. 5, p. 56, t. XIV, f. 73.

Long. 58 μ; lat. 28 μ.

On rocks in riverbed, abundant amongst *Cosmarium læve.*

Area: Europe, N. America, W. Indies, India, Madagascar, and W. Africa.

22. **P. Navicula** Bréb. in Mém. Soc. Scient. Nat. Cherbourg, 1856, IV, p. 146, t. 11, f. 37.

Long. 32,5 μ; lat. 9,6 μ.

In stagnant water in the jungle.

Area: Europe, N. America. W. Indies, India, Burmah, Ceylon, Singapore E. Indies, Sandwich Is., New Zealand and Australia.

23. **P. minutissimum** Nordst. in Acta Univ. Lund. 1873, tom. IX, p. 46, t. I, f. 21.

Long. 17 μ; lat. 10,6 μ.

In stagnant water in riverbed.
Area: Europe, Madagascar, Burmah.

24. **P. inconspicuum** West in Journ. Roy. Micr. Soc. 1894, p. 4, t. I, f. 6, 7.

Long. 17 μ; lat. 6 μ.

Amongst other Desmids in stagnant water.
Area: Europe and N. America. Ceylon.

Closterium Nitzsch.

25. **C. prælongum** Bréb. in Mém. Soc. Scient. Nat. Cherbourg, 1856, IV, p. 152, t. 11, f. 41.

Long. 459—625 μ; lat. 16,5—18 μ.

In stagnant water in the jungle.
Area: Europe and N. America. New Zealand (forma).

26. **C. acerosum** Ehrenb. in Abhandl. Akad. Wissenschaft. Berlin 1831, p. 68; Ralfs Brit. Desm. 1848, p. 154, t. XXVII, fig. 2.

Forma apicibus truncatis; membrana luteo-brunnea, subtilissime striolata. Long. 436—583 μ; lat. 45 μ; lat. apic. 8—9 μ. (Tab. nostr. II, fig. 5.) Diam. zygosp. 87 μ.

The apices were much more truncate than in var. *truncatum* Gutw. (in Spraw. Kom. fizyjogr. Akad. Umiej. Krakow. 1891, p. 33, t. 1, f. 7); in fact, Gutwinski's variety appears to be very little different from the typical form.

Area: Ubiquitous.

27. **C. Lunula** Nitzsch 1817; Ralfs Brit. Desm. 1848, p. 163, t. XXVII, f. 1. *Vibrio Lunula* Müller 1784.

Var. **sublanceolatum** Klebs in Schrift. phys.-oekon. Gesellsch. Königsberg V, 22, 1879, p. 6, t. 1, f. 1 *e* et *f*.

Forma minor, cellulis paullo angustioribus; membrana lutea, glabra. Long. 282 μ; lat. 32,5 μ; lat. apic. 8,5 μ.

This form approaches very closely to the plant mentioned and figured by Gutwinski as *Cl. acerosum* Ehrenb. forma (Roypraw. Wydz. matem.-przyr. Akad. Umiej. Krakow. 1896, tom. XXXIII, p. 36, t. V, f. 6).

Area of type: Europe, N. and S. America, E. Africa, India, Central Asia, Japan, New Zealand and Australia.

28. **C. Ehrenbergii** Menegh. Synops. Desm. in Linnæa 1840, p. 232; Ralfs Brit. Desm. 1848, p. 166, t. XXVIII, f. 2.

Lat. 90 μ; apicibus 442 μ inter se distantibus.

In stagnant water amongst *Spirogyra decimina* var.

Area: Europe, N. and S. America, W. Indies, India, Central China, Japan, New Zealand, Australia, and Samoa (var.).

29. **C. Dianæ** Ehrenb.; Ralfs l. c. p. 168, t. XXVIII, f. 5.

Lat. 21 μ; apicibus 263 μ inter se distantibus.

With the preceding species.

Area: Ubiquitous.

30. **C. parvulum** Näg. Gatt. einzell. Alg. 1849, p. 106, t. VI C, f. 2.

Lat. 10,5 μ; apicibus 130—144 μ inter se distantibus; diam. zygosp. 33 μ.

In stagnant water among other Desmids (with zygospores).

Area: Ubiquitous.

31. **C. calosporum** Wittr. in Nova Acta Soc. Scient. Upsala, ser. 3, VII, 1569, p. 23, t. I, f. 11.

Forma: lat. 7—7,5 μ apicibus 87—89 μ inter se distantibus.

This plant, which occurred in great abundance in stagnant water in the jungle, differs from typical *Cl. calosporum* in being a little narrower, the ventral margin having precisely the correct curvature.

Area: Europe, Ceylon.

32. **C. Venus** Kütz. Phyc. German. 1845, p. 130; Ralfs Brit. Desm. 1848, p. 220, t. XXXV, f. 12.

Lat. 7 μ; apicibus 51 μ inter se distantibus.

In stagnant water.

Area: Europe, N. America, Burmah, Ceylon, Central China, Japan.

33. **C. Jenneri** Ralfs Brit. Desm. 1848, p. 167, t. XXVIII, f. 6.

Forma minor, membrana plerumque luteo-brunnea.

Lat. 8,5—9 μ; apicibus 55—60 μ inter se distantibus.

Numerous examples of this small form were observed and almost all of them possessed a yellowish-brown cell-wall. The proportion and relative curvature were exactly those of *Cl. Jenneri* Ralfs.

Area: Europe, N. America, E. Africa.

34. **C. Cynthia** De Not. Desm. Ital. p. 65, t. VII, f. 71; Cooke Brit. Desm. p. 26—27.

Lat. 10,5 μ; apicibus 82 μ inter se distantibus.

In muddy ricefields.

Area: Europe, N. America, E. Africa, Ceylon, Sumatra, New Zealand and Australia.

35. **C. regulare** Bréb. in Mém. Soc. Sciences, Cherbourg, 1856, IV, p. 304, t. II, f. 35.

Forma apicibus crassioribus; striis validis, visis 11.
Long. 240 μ; lat. 26,5 μ; lat. apic. 8,5 μ.

With the preceding species.
Area: Europe, W. Africa, India, Australia.

36. **C. Ralfsii** Bréb. in Ralfs Brit. Desm. 1848, p. 174, t. XXX, f. 2.

Var. **hybridum** Rabenh. Krypt. Fl. Sachs. p. 174; Flor. Europ. Algar. III, p. 135.

Long. 464 μ; lat. 29,5 μ; lat. apic. 6 μ.

Area: Europe, Ceylon and Singapore.

37. **C. Kützingii** Bréb. in Mém. Soc. Sciences, Cherbourg, 1856, IV, p. 156, t. II, f. 40.

Long. 467—540 μ; lat 17 μ.

In stagnant water among *Spirogyra decimina* var.
Area: Europe, N. America, Madagascar, India, Ceylon, Japan, New Zealand and Australia.

38. **C. Cornu** Ehrenb. 1830; Ralfs Brit. Desm. 1848, p. 176, t. XXX, f. 6 *f* et *g*.

Var. **siamense** West & G. S. West, n. var. (Tab. nostr. II, fig. 6—7).

Var. cellulis minus curvatis; zygospora subquadrata, angulis submamillatis.
Long. 140 – 165 μ; lat. 5,5—7,5 μ; diam. zygosp. 23—25 μ.

This variety differs from typical *Cl. Cornu* Ehrenb. in being somewhat less curved, and in the form of the zygospore, the angles of which are not so produced and do not project within the empty semicells. The zygospore is surrounded by a mucous investment and the semicells are attached to the outer edge of this mucus.

In muddy ricefields.
Area: Europe, N. and S. America. Australia.

39. **C. tumidum** Johnson in Bull. Torr. Botan. Club, vol. 22, no. 7, July 1895, p. 291, t. 293, f. 4. *C. Cornu* var. β Ralfs Brit. Desm. 1848, p. 176, t. XXX, f. 6 *a—e*. *C. Cornu* et forma *major* Wille in Öfvers. af K. Vet.-Akad. Förh. 1879, no. 5, p. 59, t. XIV, f. 80, 81.

a. Forma cellulis crassioribus. (Tab. nostr. II, fig. 4).
Long. 125 μ; lat. 18,5 μ; lat. apic. 4 μ.
The form observed was proportionately a little thicker than *Cl. tumidum* Johns., and the ventral margin was slightly less tumid. The relative increase in thickness was due to the somewhat greater curvature of the dorsal margin. The cell-wall was quite smooth and colourless and the apices were truncate exactly as in Johnson's figures.

In general appearance and curvature this form resembles *Cl. littorale* Gay var. *crassum* West & G. S. West, but it is readily distinguished by its much smaller size and its truncate apices.

b. Forma polis paullo crassioribus. (Tab. nostr. II, fig. 3).
Long. 100 μ; lat. 14,5 μ; lat. apic. 5,5 μ.

On rocks in riverbed.
Area: Europe, N. America, Samoa.

40. **C. gracile** Bréb. 1839, in Mém. Soc. Sciences, Cherbourg, 1856, IV, p. 155, t. II, f. 45. *C. limneticum* Lemmermann in Plöner Forschungsberichten, Teil 7, 1899, p. 28, t. II, f. 39—41.

Long. 269 μ; lat. 6,5 μ.

In muddy ricefields.
Area: Europe, N. and S. America, E. Africa, Sumatra, New Zealand and Australia.

41. **C. acutum** Bréb. in Ralfs Brit. Desm. p. 177, t. XXX, f. 5 *a* et *b*.

Long. 138—144 μ; lat. 5,3—7 μ.

In muddy ricefields.
Area: Europe, N. America, E. Africa, India, Burmah, Sumatra, Central China. New Zealand and Australia.

Pleurotænium Näg.

42. **P. Trabecula** Näg. Gatt. einzell. Alg. 1849, p. 104, t. VI, f. A. *Closterium Trabecula* Ehrenb. 1830.

Long. 462—564 μ; lat. ad bas. semicell. 28—30,5 μ; lat. ad apic. semicell. 20—20,5 μ.

In stagnant water in riverbed.
Area: Europe, N. and S. America, Siberia, India, E. Indies, Sandwich Is., China, Japan, Abyssinia.

43. **P. maximum** Lund. in Acta R. Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 89. *Docidium maximum* Reinsch in Abhandl. Naturhist. Gesellsch. zu Nürnberg, III, 1866, p. 1884, t. XII, f. 4. *Pleurotænium Archerii* Delp. in Memor. Accad. Sci. Torino, ser. 2, XXX, 1877, p. 118, t. XIX, fig. 12—16.

Long. 522—560 μ; lat. ad bas. semicell. 38—41,5 μ; lat. ad med. semicell. 31—33 μ; lat. ad apic. semicell. 22—24 μ.

In stagnant water among other Desmids.
Area: Europe, N. America, Abyssinia, W. Africa, Ceylon, Central China.

44. **P. gloriosum** West & G. S. West. *Docidium gloriosum* Turn. in Kungl. Sv. Vet. Akad. Handl. Bd. 25, no. 5, 1893, p. 30, t. III, f. 5.

Forma paullo minor, inflatione parva singula ad basin semicellularum.

Long. 674—858 μ; lat. ad bas. semicell. 33 μ; lat. ad med. semicell. 28 μ; lat. ad apic. semicell. 35 μ. (Tab. nostr. II, fig. 1).

The tubercles, which are situated just below the apex, were about 24 in number. They are much less conspicuous than the tubercles of many other *Pleurotænia* of this nature, and consist of somewhat slight plications of the cell-wall at the apex. In fact, the tubercles of all *Pleurotænia* of this nature are primarily due to a series of short (but prominent) foldings or plications round the apex. In a few species these plications are surmounted by actual bead-like outgrowths, but this is not often the case.

In stagnant water among *Spirogyra decimina* var.
Area: India.

45. **P. trochiscum** West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1896, p. 235, t. XIII, f. 4, 5; cfr. Journ. Linn. Soc. bot. XXXIII, 1898, p. 285—286.

Long. 335—468 μ; lat. ad bas. semicell. 38—42 μ; lat. ad apic. semicell. 26—29 μ.

The Siamese specimens differed from the American ones in being a little thicker towards the base of the semicells. In the character, arrangement and number of the markings they were absolutely identical.

In stagnant water in the jungle, and in muddy ricefields, abundant.
Area: N. America, Ceylon.

46. **P. hypocymatium** West & G. S. West l. c. 1896, p. 234, t. XIII, f. 1.

Forma paullo major, undulis paucioribus eis ad basin majoribus.
Long. 451 μ; lat. ad bas. semicell. 19 μ; lat. ad apic. semicell. 12,5 μ.

The Siamese specimens were a little longer than the American ones and the undulations did not extend so near the ends of the semicells. As the basal undulation was also a little larger than the others the *Pleurotænium* bore a certain amount of resemblance to *P. basiundatum* West & G. S. West.

In stagnant water.
Area: N. America, Ceylon (var *angustum*).

Euastrum Ehrenb.

47. **E. ansatum** Ehrenb.; Ralfs Brit. Desm. 1848, p. 85, t. XIV, f. 2.

In muddy ricefield.
Area: Ubiquitous.

48. **E. sinuosum** Lenorm. in Ralfs l. c. p. 85, t. XIII, f. 5 *a*, *b*, *d*. *E. circulare* Hass.

Long. 61 μ; lat. 39 μ; lat. isthm. 10 μ.

In stagnant water.

A small form was observed somewhat approaching var. **reductum**

West & G. S. West (in Journ. Bot. March 1897, p. 83; in Journ. Linn. Soc. bot. XXXIII, 1897, p. 160, t. VIII, f. 17).

Long. 54 μ; lat. 34,5 μ; lat. isthm. 11,5 μ.

Among *Utricularia* in riverbed.

Area: Europe, N. America, E. and W. Africa, India, Ceylon, Burmah, Singapore, Sandwich Is., New Zealand and Australia.

49. **E. insulare** Roy in Scott. Natur. April 1877. *E. binale* var. *insulare* Wittr. in Bih. til K. Sv. Vet.-Akad. Handl. Bd. 1, no. 1, 1872, p. 49, t. IV, f. 7.

In stagnant water in the jungle and in muddy ricefields, abundant.

Area: Europe, N. America, E. Africa, India and Ceylon.

50. **E. binale** Ehrenb. 1840; Ralfs Brit. Desm. 1848, p. 90, t. XIV, f. 8. *Heterocarpella binalis* Turp. 1820.

Long. 14 μ; lat. 11 a; lat. isthm. 5 μ.

In muddy ricefields.

Area: Ubiquitous.

51. **E. denticulatum** Gay in Bull. Soc. Bot. France, XXXI, 1884, p. 335. *E. binale* var. *denticulatum* Kirchn. in Cohn Krypt. Flor. Schlesien, 1878, p. 159.

Long. 22 μ; lat. 15,5 μ; lat. isthm. 5 μ.

In stagnant water in the jungle.

Forma minor.

Long. 13 μ; lat. 11,5 μ; lat. isthm. 3,5 μ; crass. 7,6 μ.

In muddy ricefields.

Area: Europe, N. and S. America. E., W., and Central Africa, Madagascar, India, Ceylon, Singapore, China, New Zealand and Australia.

Micrasterias Ag.

52. **M. foliacea** Bail. in Ralfs Brit. Desm. 1838, p. 210, t. XXXV, f. 3; Johnson in Bot. Gaz. XIX, p. 56, t. VI, f. 1—4.

Long. 58—60 μ; lat. 79—81 μ.

In stagnant water in the jungle, abundant.

Area: N and S. America, India, Ceylon, Burmah, Java, Queensland.

53. **M. Mahabuleshwarensis** Hobson in Quart. Journ. Micr. Sci. V, 1863, p. 168 c. icone; Lund. in Nova Acta R. Soc. Scient. Upsala. ser. 3, VIII, 1871, p. 15, t. I, f. 6.

In stagnant water in the jungle, abundant.

Area: Europe, N. America. British Guiana. E. Africa and Madagascar (var. tetracera West & G. S. West). India, Burmah, Java. New Zealand (var.) and Australia.

Var. **surculifera** Lagerh. in Bih. till K. Sv. Vet.-Akad. Handl. Bd. 13, no. 9, 1888, p. 5, t. I, f. 1.

Long. 98 μ; lat. 100 μ; lat. isthm. 18 μ; crass. 49.

In muddy ricefield.

Area: India and Ceylon.

54. **M. Möbii** West & G. S. West in Journ. Linn. Soc. bot. XXXIII, 1897, p. 162. *Euastrum verrucosum* Ehrenb. var. *Möbii* Borge in Bih. till K. Sv. Vet.-Akad. Handl. XXII, no. 9, 1896, p. 13, t. II, f. 18, 19. *E. verrucosum* forma Möbius in Abhandl. d. Sencknb. naturf. Ges. Frankfurt a. M. 1894, Bd. 18, p. 340, t. II, f. 21.

M. mediocris, circiter $1^1/_5$-plo longior quam lata, profunde constricta, sinu leviter aperto ad extremum lineari et subampliato (nonnunquam sinu angusto-lineari extremo ampliato et aperto extrorsum); semicellulæ trilobæ, incisuris latis et rotundatis; lobo polari multo majori, incudiformi, late expanso cum collo latissimo, apice convexo sed in medio late et leviter retuso, extremitatibus lateralibus emarginato-truncatis; lobis lateralibus breviter subtrapeziformibus, leviter bilobulatis, lobulo superiori minori cum apice undulato-truncatis, lobulo inferiori majori cum margine levissime et subirregulariter undulato; in centro semicellularum tumore magno dense scrobiculato, tumore minimo intra lobum lateralem unumquemque; membrana cellularum irregulariter et minute granulata; a vertice visæ oblongo-ellipticæ tumore magno utrobique, polis rotundatis, lobo polari oblongo-subrectangulari, lateribus convexis, polo unoquoque in processus crassos breves divaricatos duos producto, lobulo superiori lobi lateralis uniuscujusque in processus breves divaricatos duos furcato; a latere visæ truncato-ovatæ, lateribus in parte superiori concavis.

Long. 111—117 μ; lat. 90—36 μ; lat. lob. polar. 76—80 μ; lat. isthm. 28—31 μ; crass. 59—60 μ. (Tab. nostr. III, fig. 21.)

We have previously shown this plant to be a *Micrasterias* and not a species of *Euastrum* (cfr. Journ. Lin. Soc. 1897, p. 162), but we give here for the first time a complete description of the typical plant. It stands nearest to *Micrasterias Americana* Ralfs.

In stagnant water in the jungle, abundant amongst *Micrasterias Mahabuleshwarensis* and various *Palmellaceæ*.

Area: Australia (Northern Queensland) Also var. *Ridleyi* from Singapore.

Var. **tetrachastriformis** West & G. S. West, n. var. (Tab. nostr. III, fig. 22).

Var. lobis lateralibus reductis, lobulo inferiori attenuato et subemarginato, lobulo superiori parvo et acute conico; extremitatibus lobi polaris plus attenuatis.

Long. 108—120 μ; lat. 88—111 μ; lat. lob. polar. 82—96 μ; lat. isthm. 24—31 μ.

This variety, which occurred in a muddy ricefield, is easily distin-

guished from the typical form by the reduced lobules of the lateral lobes and the greater attenuation of each extremity of the polar lobe. It receives its name from its resemblance to those species of *Micrasterias* which were at one time placed under *Tetrachastrum*.

55. **M. rotata** Ralfs in Ann. Mag. Nat. Hist. V, 1844, p. 299, t. VI, f. 1; Brit. Desm. 1848, p. 71, t. VIII, f. 1.

In stagnant water in the jungle.

Area: Europe, N. and S. America. India, Singapore. Japan.

Cosmarium Corda.

56. **C. pseudopyramidatum** Lund. in Nova Acta R. Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 41, t. II, f. 18.

Long. 54 μ; lat. 36 μ; lat. isthm. 11 μ.

Area: General in temperate and tropical climates.

57. **C. læve** Rabenh. Flor. Europ. Algar. III, 1868, p. 161; Nordstedt in Öfvers. af K. Vet.-Akad. Förh. 1876, no. 6, p. 29, t. XII, f. 4; G. S. West in Journ. Linn. Soc. bot. 1899. (Tab. nostr. II, fig. 14.)

Long. 22—25 μ; lat. 16—19,5 μ; lat. isthm. 5,8—6,7 μ; crass. 9—10 μ. Zygosporæ angulari-globosæ, glabræ, angulis leviter incrassatis. Diam. zygosp. 22—25 μ. (Tab. nostr. II, fig. 15—16).

This occured in enormous quantity on rocks in a riverbed and the zygospores were abundant. We have previously described what we then thought to be this plant in zygospore (cfr. West & G. S. West in Journ. Roy. Micr. Soc. 1896, p. 154—5, t. IV, f. 35; West in Notarisia 1892, p. 1502), but we can now definitely say that is was not. The *Cosmarium* we described from Portugal as *C. læve* with zygospores („zygosporæ globosæ' spinis brevibus numerosis truncatis bifidisve ornatæ") is certainly not *C. læve* Rabenh., but some other closely allied species with smooth cells and a spiny zygospore. We are sure of this because we have now obtained *C. læve* Rabenh. in zygospore in such great quantity.

Area: Europe, N. and S. America, E. and W. Africa, Madagascar, India, Ceylon, E. Indies, New Zealand and Australia.

58. **C. pseudonitidulum** Nordst. in Acta Univ. Lund. IX, 1873, p. 16, t. I, f. 4.

Long. 37 μ; lat. 25 μ; lat. isthm. 7,5 μ; crass. 16 μ.
All the forms seen were very delicately punctate.

In stagnant water in riverbed amongst *Spirogyra gracilis*. Also among *Utricularia* in riverbed.

Area: Europe, Central China.

59. **C. obsoletum** Reinsch in Abhandl. Senckenb. naturf. Gesellsch. VI, 1867, p. 142, t. XXII D I, f. 1—4; in Abhandl. Naturhist. Gesellsch. zu Nürnberg III, 167, p. 184, t. XII, f. 4. *C. palustre* Turner in Kongl.

Sv. Vet.-Akad. Handl. Bd. 24, no. 5, 1893, p. 60, t. VIII, f. 65, t. IX, f. 2. *C. palustre* var. *ovale* Turn. l. c.

a. Typical forms of the usual size of this species in the tropics.

Long 60—64 μ; lat. 69—75 μ; lat. isthm. 30—31 μ.

These specimens were exactly like those from Ceylon and Singapore, and all possessed the large conical pore which passes through the thickening at the basal angles of the semicells. Turner, who misinterpreted the nature of this pore, figured it as a spine at the angle, and thus created a new name „*C. palustre*" for typical specimens of the large form of *C. obsoletum* so abundant in tropical Asia.

b. Smaller forms without the conical pore at the basal angles.

Long. 34 μ; lat. 44 μ; lat. isthm. 15,5—18 μ; crass. 23 μ.

The above two forms show a marked difference in size and correspond to the two forms mentioned by Lütkemüller from Central China (Cfr. Ann. des k. k. Naturhist. Hofmus. Wien, 1900, Bd. XV, Heft 2, p. 119).

Abundant in stagnant water in the jungle.

Area: Europe, N. and S. America, India, Ceylon, Burmah, Central China, E. Indies, New Zealand and Australia.

60. **C. subauriculatum** West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1895, p. 55, t. VI, f. 31.

Long. 46 μ; lat. sine spinul. 48 μ, cum spinul. 52 μ; lat. isthm. 21 μ; crass. 29 μ. (Tab. nostr. II, fig. 19.)

In stagnant water among other Desmids.

Area: Madagascar, Central China.

Var. **truncatum** West & G. S. West, n. var. (Tab. nostr. II, fig. 20.)

Var. angulis truncatis, spinis binis reductis ornatis; a vertice visis ut in forma typica.

Long. 41 μ; lat. 46 μ; lat. isthm. 18 μ; crass. 24 μ.

Compare with the front view of *C. erosum* Delp.

In stagnant water in the jungle.

61. **C. Schmidtii** West & G. S. West, n. sp. (Tab. nostr. III, fig. 27—28.)

C. parvum, paullo longius quam latum, modice constrictum, sinu breviter lineari extrorsum aperto; semicellulæ elliptico-semicirculares (cellulæ subcirculares), isthmo lato; a vertice visæ ellipticæ; a latere visæ subcirculares; membrana delicatissime et dense punctulata, pyrenoidibus singulis.

Long. 22—23 μ; lat. 18—20 μ; lat. isthm. 8,5—9,5 μ; crass. 11,5—12,5 μ.

After much consideration we have come to the conclusion that this must be described as a distinct species. The shape of the semicells and the wide isthmus are characteristic. Perhaps the nearest species are *C. melanosporum* Arch. and *C. nitidulum* De Not., but from both these species it is easily distinguished.

In large numbers amongst *C. læve* Rabenh. on rocks in a riverbed, and also in stagnant water amongst various species of *Spirogyra*.

62. **C. subtriordinatum** West & G. S. West in Journ. Bot. April 1897, p. 122, t. 368, f. 11.

Forma. (Tab. nostr. II, fig. 18.)

Long. 22—24 μ; lat. 21 μ; lat. isthm. 6—6,5 μ; crass. 12,5—13,5 μ.

These forms only differ from the African examples in the somewhat simplified central granules. They are distinguished from *C. subpunctulatum* Nordst. by their smaller size, much fewer and more acute granules, and by the different arrangement of the central granules.

In stagnant water in the jungle.

Area: W. Africa.

63. **C. pseudotaxichondrum** Nordst. in Öfvers. af K. Vet.-Akad. Förh. 1877, no. 3, p. 20, t. II, f. 5.

Var. **siamense** West & G. S. West, n. var. (Tab. nostr. III, fig. 26).

Var. sinu apertiori, semicellulis minus angularibus, marginibus lateralibus leviter undulatis, cum serie granulorum magnorum 3 trans medium semicellulæ uniuscujusque.

Long. 26 μ; lat. 29 μ; lat. isthm. 6,5 μ; crass. 17 μ.

This variety is nearest to *C. pseudotaxichondrum* var. *africanum* West & G. S. West (in Journ. Bot. May 1897, p. 173, t. 367, f. 14).

In stagnant water in the jungle.

Area: This species (with its varieties) is widely distributed in tropical and subtropical regions.

64. **C. quadrifarium** Lund in Nova Acta Soc. Scient. Upsala, ser. 3, VIII, p. 32, t. III, fig. 12.

Forma **hexasticha** Nordst. in Kongl. Sv. Vet.-Akad. Handl. Bd. 22, no. 8, p. 49; *C. hexastichum* Lund. l. c. p. 33, t. III, f. 13.

Long. 53 μ; lat. 41 μ; lat. isthm. 17 μ; crass. 29 μ.

In stagnant water in riverbed.

Area of type: Europe, N. America, Ceylon.

65. **C. subdecoratum** West & G. S. West in Journ. Linn. Soc. bot. XXXIII, 1897, p. 164, t. VIII, f. 13.

Long. 76 μ; lat. 54—59 μ; lat. isthm. 19—22 μ.

In stagnant water in the jungle.

Area: Ceylon and Singapore.

66. **C. pseudorthopunctatum** West & G. S. West, n. sp. (Tab. nostr. II, fig. 12—13.)

C. parvum, circiter tam longum quam latum, profunde constrictum sinu aperto et acutangulo; semicellulæ subellipticæ, ventre valde convexæ, dorso valde convexæ in medio subrectæ, angulis

leviter subangularibus; membrana granulata, granulis in seriebus verticalibus 9—10 (in serie unaquaque circiter 5); a vertice visæ ellipticæ; a latere visæ circulares; pyrenoidibus singulis.

Long. 24 μ; lat. 20—23,5 μ; lat. isthm. 5,7—6,8 μ; crass. 12 μ.

It is nearest to *C. orthopunctatum* Schmidle (in Oesterr. botan. Zeitschrift 1895, p. 389, t. XV, f. 15) but is much smaller, has more flattened apices, and both the rows of granules and the number of granules in each row are much fewer in number. The vertical view is also more narrowly elliptical and is never rhomboidal.

On rocks in riverbed among *C. læve* Rabenh.

67. **C. Blyttii** Wille in Vid.-Selsk. Forhandl. Christiania, 1880, no. 11, p. 25, t. I, f. 7.

Long. 17 μ; lat. 16 μ; lat. isthm. 4,7 μ.

In stagnant water in the jungle.

Area: Europe, N. America. West, Central and East Africa. Madagascar. Ceylon, Central China, New Zealand and Australia.

Forma minor: Long. 13,5 μ; lat. 13 μ; lat. isthm. 2,8 μ; crass. 8,5 μ.

In muddy ricefields.

68. **C. Reinschii** Archer in Quart. Journ. Micr. Sci., n. s. VI, p. 109. *C. sp.* Reinsch Contrib. Alg. et Fung. Lipsiæ 1875, t. XVIII, f. 4.

Membrana cellulæ subtilissime punctata.

Long. 37 μ, lat. 30 μ; lat. isthm. 8 μ; crass. 16 μ.

In stagnant water amongst *Spirogyra decimina* var.

Area: Europe, N. America, Australia.

69. **C. æquatum** West & G. S. West, n. sp. (Tab. nostr. II, fig. 17.)

C. parvum, paullo latius quam longum, profunde constrictum, sinu sublineari et paullo aperto; semicellulæ transverse oblongæ, marginibus lateralibus rotundatis, apicibus latissimis leviter concavis; a vertice visæ oblongæ, polis rotundatis; a latere visæ circulares; membrana glabra.

Long. 31 μ; lat. 36 μ; lat. isthm. 13,2 μ; crass. 15,3 μ.

Among *Utricularia* in riverbed.

70. **C. exiguum** Archer in Proc. Dubl. Nat. Hist. Soc. IV, 1864, p. 49, t. I, f. 32, 33; Nordst. in Kongl. Sv. Vet.-Akad. Handl. Bd. 22, no. 8, p. 58, t. VI, f. 12.

Long. 15,3 μ; lat 8 μ; lat. isthm. 1,6 μ.

In stagnant water amongst *Spirogyra*.

Area: Europe, N. America, W. Africa, Madagascar, Ceylon, New Zealand.

71. **C. Norimbergense** Reinsch in Abhandl. Naturhist. Gesellsch. zu Nürnberg, Bd. 3, 1866, p. 113, t. IX, f. 2. *C. Hammeri* Reinsch var.

octogibbosum Reinsch l. c. p. 112, t. X, f. 1. *C. octogibbosum* (Reinsch) Turner 1893. *C. octogibbosum* var. *indica* Turn.

Forma **depressa** West & G. S. West in Journ. Bot. April 1897, p. 119.

Long. 14,5—15,5 μ; lat. 13,5—14 μ; lat. isthm. 5 μ.

Area: Europe, W. and E. Africa (vars.), India and Ceylon (forms), Burmah, E. Indies (var.), Central China, New Zealand.

72. **C. Meneghinii** Bréb. in Ralfs Brit. Desm. 1848, p. 96, t. XV, f. 6.

Long. 22 μ; lat. 16 μ; lat. isthm. 4,5 μ.

Forma: cells narrower and semicells more rounded.
Long. 18—19 μ; lat. 12,5—13,5 μ; lat. isthm. 3,5—3,8 μ; crass. 8 μ.

In stagnant water in the jungle with the preceding species.
Area: Ubiquitous.

73. **C. angulosum** Bréb. in Mém. Soc. Sci. Nat. Cherbourg, IV, 1856, p. 127, t. I, f. 17. *C. Meneghinii* Bréb. var. *angulosum* Rabenh. 1868.

Var. **concinnum** West & G. S. West. *C. concinnum* Reinsch.

Long. 12 μ; lat. 10 μ; lat. isthm. 2,6 μ.

In stagnant water amongst *Spirogyra*.
Area: Europe, N. America, Madagascar. W. Africa.

74. **C. pusillum** Arch. in Pritch. Infus. 1861, p. 731. *Euastrum pusillum* Bréb. 1856.

Long. 12 μ; lat. 11 μ; lat. isthm. 4,5 μ.

Area: Europe, S. America, India, Ceylon, N. Zealand.

75. **C. contractum** Kirchn. Alg. Schlesien, Breslau 1878, p. 147; Wolle Desm. U. S. 1884, p. 63, t. 50, f. 24.

Forma minor: long. 26 μ; lat. 20 μ; lat. isthm. 3,8 μ; crass. 13 μ.

Except for its rather more open sinus this form is identical with that known as *C. ellipsoideum* Elfv. forma *minor* Racib. in Pamietnik Akad. Umiej. w Krakowie, Wydz. matem.-prz. X, 1885, p. 84, t. X, f. 9. (= *C. proteiforme* Turner in Kongl. Sv. Vet.-Akad. Handl. Bd. XXV, no. 5, 1893, p. 64, t. IX. f. 26).

C. ellipsoideum Elfv. does not differ sufficiently from *C. contractum* Kirchn. to warrant its separation as a distinct species.

In stagnant water in the jungle.
Area: Generally distributed.

76. **C. emarginatum** West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1895, p. 58, t. VIII, f. 14.

Long. 9—10 μ; lat. 8,3—9,5 μ; lat. isthm. 4,4 μ; crass. 4,6 μ.

With the preceding species.
Area: Madagascar. E. Africa (var.).

77. **C. exile** West & G. S. West. *Dysphinctium exile* Turner in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, p. 40, t. I, f. 21 *.

Forma curta; cellulis diametro subduplo longioribus.
Long. 13—15 μ; lat. 7,5—8,5: lat. isthm. 5,9—6,3 μ.

In stagnant water amongst various Algæ.
Area: India.

78. **C. pseudarctoum** Nordst. in Wittr. & Nordst. Alg. Exsicc. no. 257 cum fig. xylogr. 1879.

Forma **australis** West & G. S. West. *C. subarctoum* (Lagerh.) Racib. forma *australis* Racib. in Rospraw. Wydz. matem.-przy. Akad. Umiej. Krakow. tom. XXII, 1892, p. 363, t. VI, f. 22.

Long. 13,5—17 μ; lat. 8,5—10 μ; lat. isthm. 7—8,5 μ.

On rocks in riverbed amongst *C. læve* Rabenh. and *C. Schmidtii* n. sp. Raciborski's Australian plant is decidedly a form of *C. pseudarctoum* Nordst.
Area: Europe, Australia.

79. **C. pseudoconnatum** Nordst. in Vidensk. Medd. f. d. naturh. Foren. Kjøbenhavn, 1869, no. 14, p. 214, t. III, f. 17.

Long. 59 μ; lat. 42,5 μ; lat. isthm. 38 μ.

In muddy ricefields.
Area: Europe, N. and S. America, India, Ceylon, Madagascar.

80. **C. subturgidum** (Turner) Schmidle in Hedwigia, Bd. XXXIV, 1895, p. 300. *Dysphinctium subturgidum* Turn. in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, p. 40, t. VII, f. 4.

Forma minor Schmidle l. c. t. IV, f. 2.
Long. 96 μ; lat. 52 μ; lat. isthm. 49 μ.

In stagnant water amongst *Spirogyra decimina* var.
Area: E. Africa, India, Sumatra, Java, Samoa, Australia.

Staurastrum Meyen.

81. **S. apiculatum** Bréb. in Mém. Soc. Sci. Nat. Cherbourg, IV, 1856, p. 142, t. I, f. 23; West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1896, p. 254, t. XVI, f. 6.

Long. sine spin. 21 μ; lat. sine spin. 21 μ; long. spin. 1,5 μ; lat. isthm. 6,5 μ.

Area: Europe, N. America, India, Japan.

82. **S. bifidum** Ralfs in Ann. Mag. Nat. Hist. V, 1845, p. 151, t. X, f. 3; Lund. in Nova Acta Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 62, t. IV, f. 2.

Forma spinis valde convergentibus.

Long. 33 μ: lat. sine spin. 29 μ; long. spin. 7—8 μ; lat. isthm. 12 μ.

On rocks in riverbed.

Area: Europe, Siberia, India, Ceylon, Java, Japan.

83. **S. echinatum** Bréb. in Ralfs Brit. Desm. 1848, p. 215, t. XXXV, f. 24.

Long. sine spin. 33 μ, cum spin. 42 μ; lat. sine spin. 29 μ, cum spin. 40 μ; lat. isthm. 9 μ. (Tab. nostr. III, fig. 31).

This *Staurastrum* of which we observed several examples, has been referred to *S. echinatum* Brèb. after much consideration. It is certainly not a form of *S. teliferum* Ralfs., neither is it a form of *S. gladiosum* Turn., the only other species with which it could be confounded. Brébisson's figure in Ralf's ‚British Desmids' (l. c.) is a very poor one, and yet our plant agrees with it in size, in outward form, in the depth of its constriction, and in relative length and number of the spines.

From *S. teliferum* Ralfs it differs in its somewhat rhomboideo-elliptical semicells which cause a much more open sinus; the spines are more numerous, a little longer and more delicate; the angles of the vertical view are not so rounded, the sides are hardly so concave, and the spines are more scattered.

From *S. gladiosum* Turn. it is distinguished by its somewhat smaller size, by its relatively longer cells, its more angular semicells and slightly more open sinus; the spines are about the same in number, but they are slightly longer and more delicate, and are more or less evenly distributed over the whole of the semicells; the angles of the vertical view are not so rounded and the spines extend all over the central part (i. e. all over the actual dorsal region of the semicells of the *Staurastrum*).

The *S. echinatum* figured by Wolle (Desm. U. S. 1884, t. 45, f. 31—32) does not represent the species, the spines being too short. That figured by Turner (in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, t. VI, f. 48) may be a form of *S. echinatum* Bréb. but it does not agree sufficiently well with Brébisson's figure in Ralfs ‚British Desmids' to represent a typical specimen. The plant recorded by Schmidle (in Engler's Botan. Jahrbuch. Bd. XXVI, 1898, p. 55) as „*St. echinatum* forma?" and figured by him (t. IV, f. 11) as „*S. echinatum* Bréb." is much too short-spined for Brébisson's species and is much nearer a small form of *S. pilosum* (Näg.) Arch.

In stagnant water in the jungle.

Area: Europe, India.

84. **S. submonticulosum** Roy et Biss., in Journ. Bot. 1886, p. 238, t. 268, f. 7.

Forma angulis propius ad basin semicellularum; isthmo paullo angustiori.

Long. 28 μ; lat. 31 μ; lat. isthm. 8 μ.

In stagnant water among other Desmids.

Area: Japan.

85. **S. orbiculare** Menegh. Synops. Desm. in Linnæa 1840, p. 225; Ralfs Brit. Desm. 1848, p. 125, t. XXI, f. 5.

Var. **depressum** Roy et Biss. l. c. p. 237, t. 268, f. 14.

Long. 21—25 μ; lat. 21—25 μ; lat. isthm. 7,5 μ—8,6 μ.

With the preceding species.

Area (of type and varieties): Ubiquitous.

86. **S. Bieneanum** Rabenh. Alg. No. 1410; West & G. S. West in Journ. Roy. Micr. Soc. 1896, p. 158, t. III, f. 27. *S. orbiculare* var. *Bieneanum* Rabenh. Flor. Europ. Algar. III, p. 200.

Var. **orientale** West. & G. S. West, n. var. (Tab. nostr. III, fig. 29.)

Var. minor, dorso semicellularum convexo (non retuso in medio); membrana glabra.

Long. 25 μ; lat. 22,5 μ; lat. isthm. 6 μ.

Only one specimen of the Siamese plant was seen and provisionally we place it as a variety of *S. Bieneanum* Rabenh. It is very probable that *S. Bieneanum* var. *orientale* will ultimately prove to be a distinct species.

Area (of type): Europe, N. America, E. Africa, Madagascar, Siberia, Japan, Samoa, New Zealand and Australia.

87. **S. Zahlbruckneri** Lütkem. in Ann. des k. k. Naturhist. Hofmus. Wien 1900, Bd. XV, Heft 2, p. 125, t. VI, f. 41—43.

Var. **mamillatum** West & G. S. West, n. var. (Tab. nostr. III, fig. 35—37.)

Var. cellulis in ambitu subcircularibus; semicellulis subdepressis semicircularibus, apicibus latissime rotundatis; angulis bilobulatis, lobulis valde mamillatis, iis semicellulæ alterius interdigitatis cum iis alterius; a vertice visis lateribus subrectis.

Long. 92 - 95 μ; lat. 80—82 μ; lat. isthm. 27—28,5 μ.

Numerous examples of this fine *Staurastrum* were seen. The typical form was recently described by Lütkemüller from the Ningpo Mountains in Central China. The Siamese variety is relatively shorter and possesses more rounded semicells; the angles are more deeply lobed and distinctly mamillate, the mamillate lobes of one angle fitting into those of the other, thus causing a striking peculiarity of the sinus, the aperture of which is rarely visible.

The cell-wall is very much thickened at the mamillate angles and shows a marked lamination. Sometimes a few lateral wart-like excrescences are present on the opposed faces of two interdigitating lobes of the angles. The cell-wall is strongly punctate as in the typical form.

In stagnant water in the jungle.

Area (of type): Central China.

88. **S. alternans** Bréb. in Ralfs Brit. Desm. p. 132, t. XXI, f. 7.

Long. 26 μ; lat. 25 μ; lat. isthm. 8,5 μ.

In muddy ricefields.

Area: Europe, N. America, E. Africa, India, Java, New Zealand and Australia.

89. **S. hexacerum** Wittr. in Bih. till K. Sv. Vet.-Akad. Handl. 1872, Bd. 1. no. 1, p. 51. *Desmidium? hexaceros* Ehrenb. 1833. *S. tricorne* Menegh. 1840; Ralfs Brit. Desm. 1848, p. 134, t. XXII, f. 11 *a* et *c*, t. XXXIV, f. 8 *a*.

Var. **tropicum** West & G. S. West, n. var. (Tab. nostr. III, fig. 30).

Var. semicellulis elliptico-fusiformibus, ventre convexiori quam dorso; granulis minutissimis in seriebus trans angulos.

Long. 16 μ; lat. 20 μ; lat. isthm. 5,4 μ,

This is probably identical with the form figured from Sumatra by Schmidle as *S. pygmæum* Bréb. var. *obtusum* Wille.

In muddy ricefields.

Area (of type): Europe, N. and S. America, W. and E. Africa, Madagascar, Japan, New Zealand.

90. **S. micron** West & G. S. West in Journ. Roy. Micr. Soc. 1896, p. 159, t. IV, f. 50, 51.

Forma spinis reductis et numerosioribus. (Tab. nostr. III, fig. 38.)

Long. cum proc. 16—17,5 μ; lat. cum proc. 19—21 μ; lat. isthm. 5—5,5 μ.

In stagnant water in the jungle.

Area: Europe, W. Africa (var.).

91. **S. pseudotetracerum** West. et G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1895, p. 79, t. VIII, f. 39. *S. contortum* Delp. var. *pseudotetracerum* Nordst. in Kongl. Sv. Vet.-Akad. Handl. Bd. 22, no. 8, p. 50, t. V, f. 14.

Var. **robustum** West & G. S. West, n. var. (Tab. nostr. III, fig. 32—34.)

Var. cellulis (sine processibus) paullo longioribus, processibus brevioribus: a vertice visis 4-radiatis.

Long. sine proc. 16—20 μ, cum proc. 19—25 μ; lat. sine proc. circ. 9,5—13 μ, cum proc. 17—26 μ; lat. isthm. 5,5—6 μ.

With the preceding species.

Area (of type): N. America, Madagascar, Ceylon, New Zealand.

92. **S. margaritaceum** Menegh. Synops. Desm. in Linnæa 1840, p. 227; Ralfs Brit. Desm. 1848, p. 134, t. XXI, f. 9.

Forma 5-gona.

In stagnant water amongst *Spirogyra decimina* var.

Var. **robustum** West & G. S. West in Journ. Roy. Micr. Soc. 1897, p. 496, t. VII, f. 14.

Long. 25,5 μ; lat. cum proc. 27,5 μ; lat. isthm. 7,5 μ.

In stagnant water in the jungle.

Area (of type): Ubiquitous.

93. **S. inconspicuum** Nordst. in Acta Univ. Lund. IX, 1873, p. 26, t. I, f. 11.

Long. 14 μ; lat. 13 μ; lat. isthm. 5,2 μ.

With the preceding species.

Area: Europe, N. America, Siberia, Burmah.

94. **S. leptacanthum** Nordst. in Vidensk. Medd. Naturh. Foren. Kjøbenhavn, 1869, p. 229, t. IV, f. 46.

Long. s. proc. 38 μ, c. proc. 76 μ; lat. s. proc. 19 μ, c. proc. 50 μ.

In muddy ricefields.

Area: N. and S. America. Senegal. Ceylon. Siberia.

Arthrodesmus Ehrenb.

95. **A. alatus** West & G. S. West, n. sp. (Tab. nostr. III, fig. 23—25).

A. parvus, circiter tam longus quam latus, profundissime constrictus, sinu angusto-lineari extremo subampliato; semicellulæ late rectangularo-trapeziformes, angulis inferioribus subrotundatis, lateribus leviter concavis et sursum divergentibus, angulis superioribus leviter productis, subrotundatis cum spina brevissima minutissima, apicibus late retusis, nonnunquam spinis brevissimis minutissimis paucis 2—4 circa angulos superiores; a vertice visæ ellipticæ, polis apiculatis; membrana delicatissime punctata.

Long. 25—31 μ; lat. bas. semicell. 20—25 μ; lat. apic. semicell. 23—27 μ; lat. isthm. 4,4—7,5 μ; crass. 12,5 μ.

Numerous examples of this species were obtained from amongst *Utricularia* in a riverbed. They varied a little in their general form and proportions, but the chief variation was in the small spines round the upper angles of the semicells. The majority of specimens possessed only the apiculations at the upper angles, but others possessed a variable number (from one to four) of small spines arranged approximately in a ring round the angles.

In outward form it cannot be mistaken for any other species of the genus.

Hyalotheca Ehrenb.

96. **H. undulata** Nordst. in Wittr. et Nordst. Alg. Exsicc. 1879, no. 248.

Long. 13—17 μ; lat. 5,7—6,7 μ.

In stagnant water in riverbed.

Area: Europe, N. America, India.

97. **H. dissiliens** Bréb. in Ralfs Brit. Desm. 1848, p. 51, t. I, f. 1.

Lat. 16—18 μ; diam. zygosp. 19—22 μ.

In stagnant water in riverbed among various species of *Spirogyra*, with zygospores.

Area: Ubiquitous.

Ord. *Protococcaceæ.*

Fam. Palmellaceæ.

Cœlastrum Näg.

98. **C. sphæricum** Näg. Gatt. einzell. Alg. 1849, p. 98, t. V, f. C 1.

In stagnant water in the jungle.

Area: Europe, N. and S. America, W. Indies, Madagascar, India, Sumatra, Siberia, New Zealand.

99. **C. pulchrum** Schmidle in Bericht. d. d. Botan. Gesellsch. Bd. X, 1892, p. 206, t. XI, f. 1.

Var. **intermedium** Bohlin in Bih. till K. Sv. Vet.-Akad. Handl. Bd. 23, no. 7, 1897, p. 35, t. II, f. 16, 17.

In stagnant water in the riverbed.

Area (of type): Europe, S. America, Ceylon, Queensland.

Pediastrum Meyen.

100. **P. duplex** Meyen. *P. pertusum* Kütz. *P. Napoleonis* Ralfs Brit. Desm. p. 184, t. XXXI, f. 7.

With the preceding species abundant.

Area: General in temperate and tropical regions.

Var. **clathratum** A. Br. Alg. Unicell. p. 93.

With the typical form.

101. **P. Tetras** (Ehrenb.) Ralfs in Ann. Mag. Nat. Hist. XIV, 1844, p. 469, t. XII, f. 4. *Micrasterias Tetras* Ehrenb. 1838.

With the preceding species and very abundant. Coenobia of 4, 1+7 and 5+11 cells.

Area: Ubiquitous.

Scenedesmus Meyen.

102. **S. bijugatus** (Turp.) Kütz. Syn. Diat. 1333, p. 607. *Achnanthes bijuga* Turp.

Abundant in stagnant water in the jungle and in muddy ricefields.

Area: Ubiquitous.

103. **S. denticulatus** Lagerh. in Öfvers. af K. Vet.-Akad. Förh. 1882, no. 2, p. 61, t. II, f. 13—16.

Var. **linearis** Hansg. in Archiv Naturwiss. Landesdurchf. Böhm. Bd. 6, 1888, p. 268.

In muddy ricefields.

Area: Europe, N. America, W. Africa, Madagascar, Ceylon.

104. **S. acutiformis** Schröder in Forschungsberichten der Plöner Biol. Stat. Heft 5, 1897, p. 17, t. II, f. 4.

Var. **spinuliferum** West & G. S. West n. var. (Tab. nostr. IV, fig. 46—49.)

Var. cænobiis e cellulis 2—8 (plerumque 4) constitutis; polis cellularum spinis curvatis minutis 2—3 instructis.

Long. cell. sine spin. 14—24 μ; lat. cell. 3,2—8,5 μ; long. spin. 1—5,7 μ.

This variety occurred in large quantity amongst other *Palmellaceæ* in stagnant water. The cœnobia were of all sizes and contained from two to eight cells. All the cells possessed the lateral ridges characteristic of this species. The small spines were very variable in number and position, but were always of appreciable length and generally considerably curved.

It bears a considerable resemblance to *S. denticulatus* var. *linearis* Hansg., but is readily distinguished by the two prominent ridges on each cell of the cœnobium. The spines at the poles of each cell are also longer and more curved than in *S. denticulatus* Lagerh.

105. **S. quadricauda** (Turp.) Bréb. in Mém. Soc. sc. nat. Falaise, bot. 1835, p. 66: Ralfs Brit. Desm. 1848, p. 180, t. XXXI, f. 12.

In stagnant water in riverbed.

Area: Ubiquitous.

Rhaphidium Kütz.

106. **R. polymorphum** Fresen. in Abhandl. der Senckenb. naturf. Gesellsch. II, p. 199, t. VIII.

Var. **aciculare** (A. Br.) Rabenh. Flor. Europ. Algar. III, p. 45.

In stagnant water in the jungle.

Var. **falcatum** (Corda) Rabenh. l. c.

With the preceding variety.

Area: This species and its varieties are ubiquitous.

107. **R. convolutum** (Corda) Rabenh. l. c. p. 46.

Lat. cell. 3,8 μ.

With the preceding species.

Area: Europe.

Selenastrum Reinsch.

108. **S. gracile** Reinsch. in Abhandl. Naturhist. Gesellsch. zu Nürnberg, III, 1866, p. 65, t. IV, f. 3 *a—b*.

In stagnant water, scarce.
Area: Europe, S. America, Abyssinia, India.

Tetraëdron Kütz.

109. **T. regulare** Kütz. Phyc. Germ. p. 129. *Polyedrium tetraëdricum* Näg. Gatt. einzell. Alg. 1849, p. 84, t. IV B, f. 3.

Diam. 22—23 μ.

Area; Europe, N. and S. America, W. Indies, E. Africa, Abyssinia, Kordofan.

110. **T. bifurcatum** Lagerh. in Nuova Notarisia 1893, p. 160. *Polyedrium tetraëdricum* Näg. var. *bifurcatum* Wille.

Diam. sine spin. 38—46 μ, cum. spin. 50—59 μ. (Tab. nostr. IV, fig. 50.)

Area: N. and S. America, W. Indies, Abyssinia, Kordofan.

111. **T. octaëdricum** (Reinsch) Hansg. in Hedwigia 1888, p. 131. *Polyedrium octaëdricum* Reinsch.

Diam. 25—27 μ.

Var. **spinosum.** *P. octaëdricum* var. *spinosum* Reinsch.

Diam. sine spin. 21—26 μ, cum spin. 32—38 μ.

Area: Europe.

112. **T. cruciatum** West & G. S. West. *Micrasterias cruciata* Wallich in Ann. Mag. Nat. Hist. ser. 3, vol. V, 1860, p. 281, t. XIII, f. 12; *Staurophanum cruciatum* Turn. in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, p. 159, t. XX, f. 20, 21.

Diam. 52—54 μ. (Tab. nostr. IV, fig. 51.)

The eight angles were bifurcate (not trifurcate) and a few of the spines were again furcate.

Amongst various Desmids, *Scenedesmus*, etc., in stagnant water in the jungle.
Area: India, Ceylon.

Reinschiella De Toni.

113. **R. siamensis** West & G. S. West, n. sp. (Tab. nostr. IV, fig. 52.)

Cellulæ magnæ, solitariæ et libere natantes, late lunato-lanceolatæ, margine exteriori multum convexo, margine interiori subrecto et levissime retuso, apicibus productis in spinas longas gracillimas et recurvatas.

Long. sine spin. 77 μ; lat. 28 μ; long. spin. circ. 17—52 μ.

Apparently a distinct species nearest to *R. crassispina* De Toni.

With various Desmids amongst *Spirogyra decimina* var. in stagnant water.

114. **R. obesa** West & G. S. West, n. sp. (Tab. nostr. IV, fig. 53—54.)

Cellulæ mediocres, solitariæ vel binæ (interdum 3), libere natantes, oblique ellipsoideæ, paullo curvatæ, margine exteriori convexo vel recto et levissime retuso, margine interiori valde convexo, apicibus spina robusta curvata brevi acutissima præditis.

Long. sine spin. 29—30,5 μ, cum spin. 42—46 μ; lat. 14 μ; long. spin. 6,5—7,5 μ.

One cell possessed a short, thick, extra spine near to one pole.

This plant differs from the other species of *Reinschiella* in the fact that the ventral (or internal) margin is much more convex than the dorsal (or external) margin. The spines thus appear to be curved in the opposite direction to the apparent curvature of the cells.

Among various *Palmellaceæ* in stagnant water in the jungle.

Dictyosphærium Näg.

115. **D. pulchellum** Wood in Smithson. Contrib. to Knowl. 1873, p. 84, t. X, f. 4. *D. globosum* Richt. in Hedwigia 1884, p. 65.

Diam. cell. 3,8—4,5 μ.

In stagnant water.

Area: Europe, N. and S. America. Abyssinia, Australia.

Botryococcus Kütz.

116. **B. Braunii** Kütz. Spec. Algar. p. 892; Rabenh. Flor. Europ. Algar. III, p. 43.

In stagnant water.

Area: Europe, N. and S. America, Abyssinia, India, Sumatra.

Ineffigiata West & G. S. West.

117. **I. neglecta** West & G. S. West in Journ. Roy. Micr. Soc. 1897, p. 503.

In stagnant water in the jungle.

Area: Europe, N. America, Ceylon.

Dimorphococcus A. Br.

118. **D. lunatus** A. Braun Alg. Unicell. p. 44; Rabenh. Flor. Europ. Algar. III, p. 36, cum fig. xylogr.; West in Journ. Roy. Micr. Soc. 1892, p. 735, t. IX, f. 39. *Scenedesmus radiatus* Reinsch.

With the preceding plant.

Area: Europe, S. America.

Oocystis Näg.

119. **O. elliptica** West in Journ. Roy. Micr. Soc. 1892, p. 736, t. X, f. 56.

Frequent in stagnant water in the jungle and in muddy ricefields.

Area: Europe, N. America, Madagascar, Ceylon.

Glœocystis Näg.

120. **G. vesiculosa** Näg. Gatt. einzell. Alg. 1849, p. 66, t. IV F.

In stagnant water amongst other *Palmellaceæ*.
Area: Europe, N. and S. America, Ceylon, Australia.

121. **G. gigas** (Kütz.) Lagerh. in Öfvers. af K. Vet.-Akad. Förh. 1883, no. 2, p. 63. *Protococcus gigas* Kütz. *Chlorococcum gigas* Grun. *Glœocystis ampla* Rabenh.

In stagnant water in the jungle and in muddy ricefields.
Area: Ubiquitous.

Kirchneriella Schmidle.

122. **K. obesa** Schmidle in Flora oder Allg. Bot. Zeitung 1894, Heft 1, p. 44. *Selenastrum obesum* West in Journ. Roy. Micr. Soc. 1892, p. 734, t. X, f. 50—52.

Crass. cell. 4,8—5,2 μ.

In stagnant water in the jungle.
Area: Europe.

Appendix.

Fam. Characeae. [1])

Chara.

123. **C. gymnopithys** Al. Br.
vel **C. flaccida** Al. Br.

The specimens were too young for a certain determination.
Muddy ricefield near Lem Dan.

Class. Florideae.

Fam. Helminthocladiaceae.

Batrachospermum Roth.

124. **B. moniliforme** Roth.
var. **confusum** (Hass.).

On rocks in small waterfalls in the jungle near Klong Son.
Area: Europe.

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[1]) Auctore O. Nordstedt.

Description of Plates.

a, *a'* = cellula vel semicellula a fronte visa.
b = " " " a vertice visa.
c = " " " a latere visa.
d = semicellula a basi visa.

Plate II.

Figure

1. *Pleurotœnium gloriosum* West & G. S. West forma. × 520.
2. *Gonatozygon Kinahani* Rabenh. var. *tropicum* West & G. S. West, n. var.
3—4. *Closterium tumidum* Johnson. Two forms. × 520.
5. *Closterium acerosum* Ehrenb. forma. With zygospore. × 120.
6—7. *Closterium Cornu* Ehrenb. var. *siamense* West & G.S.West, n. var. × 520.
8—11. *Cylindrocystis subpyramidata* West & G. S. West, n. sp. × 520.
12—13. *Cosmarium pseudorthopunctatum* West & G. S. West, n. sp. × 520.
14—16. *Cosmarium læve* Rabenh. 15 and 16, zygospores. × 520.
17. *Cosmarium æquatum* West & G. S. West, n. sp. × 520.
18. *Cosmarinm subtriordinatum* West & G. S. West forma. × 520.
19. *Cosmarium subauriculatum* West & G. S. West. × 520.
20. " var. *truncatum* West & G. S. West, n. var. × 520.

Plate III.

21. *Micrasterias Möbii* West & G. S. West. × 520.
22. " " var. *tetrachastriformis* West & G. S. West, n. var, × 520.
23—25, *Arthrodesmus alatus* West & G. S. West, n. sp. × 520.
26. *Cosmarium pseudotaxichondrum* Nordst. var. *siamense* West & G. S. West, n. var. × 520.
27—28. *Cosmarium Schmidtii* West & G. S. West, n. sp. × 520.
29. *Staurastrum Bieneanum* Rabenh. var. *orientale* West & G. S. West, n. var. × 520.
30. *Staurastrum hexacerum* Wittr. var. *tropicum* West & G. S. West, n. var. × 520.
31. *Staurastrum echinatum* Bréb. × 520.
32—34. *Staurastrum pseudotetracerum* West & G. S. West var. *robustum* West & G. S. West, n. var. × 520.
35—37. *Staurastrum Zahlbruckneri* Lütkem. var. *mamillatum* West & G. S. West, n. var. × 520.
38. *Staurastrum micron* West & G. S. West, forma. × 520.

Plate IV.

39—41. *Œdogonium maximum* West & G. S. West, n. sp. × 220.
42. *Œdogonium dioicum* Carter. × 220.
43—45. *Spirogyra Schmidtii* West & G. S. West, n sp. 43 and 44, × 220; 45, × 520.
46—49. *Scenedesmus acutiformis* Schröder var. *spinuliferum* West & G. S. West, n. var. × 520.
50. *Tetraëdron bifurcum* Lagerh.
51. *Tetraëdron cruciatum* West & G. S. West. × 520.
52. *Reinschiella siamensis* West & G. S. West, n. sp. × 520.
53—54. *Reinschiella obesa* West & G. S. West, n. sp. × 520.

Marine Algae[1])

(Chlorophyceae, Phaeophyceae, Dictyotales, Rhodophyceae [2])

by **Th. Reinbold** — Itzehoe.

Chlorophyceae.

Ulvaceae.

Enteromorpha Link.

1. **E. plumosa** Kg. Phyc. gen. p. 300, non Ahln; De Toni Syll. I. p. 132. — *E. Hopkirkii* (M' Calla) Harv. — *E. paradoxa* Kg. Spec. p. 479.

Our specimen represents a very delicate form which agrees with *E. paradoxa β. angustissima* Kg. Tab. phyc. VI. t. 35. Epiphytic on *Laurencia obtusa*.

Koh Chang-Strait in shallow water, in some places between tide-marks.

Area: Baltic; Atlantic; Mediterranean; Australia (probably more widely distributed).

Protoderma Kg.

2. **P. sp.**

Very thin indefinite membranaceous layers on shells. The plant tolerably agrees with *P. marinum* Rke. Algenfl. W. Ostsee p. 81. which is abundant in the Baltic and the German Sea, covering stones and shells. (cfr. *P. viride* Kg. Tab. phyc. VI. t. 11). In Engl. u. Prantl Pflanzf. p. 78 *Protoderma* is denoted as genus dubium.

Lem Ngob, on dead shells in the mangrove.

Caulerpaceae.

Caulerpa Lamx.

3. **C. filiformis** (Harv.) J. Ag. Alg. Syst. I. p. 5; Web. v. Bosse Caulerpa p. 262; De Toni Syll. I. p. 442. — *Herpochaete filiformis* Harv. List Friendl. Isl. Alg. Nr. 95.

Fragments only.

Koh Kahdat in 1—2 fathoms water (coral-sand).

Area: Friendly Islds.

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[1]) With an asterisk I have marked the species already known from Siam.

[2]) As to the marine *Myxophyceae* see the following paper by Gomont. As to the *Corallinaceae* see part II. of these contributions.

4. **C. fastigiata** Mont. Cent. I. Nr. 16; Web. v. Bosse l. c. p. 262; De Toni Syll. I. p. 442.

f. **minor** Web. v. Bosse l. c. p. 263.

The little plants exactly agree with the original specimen (in the Botan. Museum of Hamburg) on which Mad. Weber v. Bosse has founded the forma *minor*.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Brazil.

5. **C. verticillata** J. Ag. Alg. Liebm. p. 6; Alg. Syst. I. p. 6; Web. v. Bosse l. c. p. 267; De Toni Syll. I. p. 443.

N. of Koh Kahdat on coral-reefs in shallow water.

Area: W. Indies; Ceylon; Friendly and Tonga Islds.

6. **C. scalpelliformis** (R. Br.) Ag. Spec. p. 437; sens. ampl. Web. v. Bosse l. c. 268. — *C. denticulata* Decn. — *Fucus scalpelliformis* R. Br. in Turn. Hist. t. 174.

Fragment only which perhaps is to be referred to var. *intermedia* Web. v. Bosse l. c. p. 287.

Between Koh Mesan and Cape Liant, in 9 fathoms water.

Area: Red Sea; Australia; Tasmania; Ceylon; Mauritius.

7. **C. plumaris** (Forsk.) Ag. Spec. p. 436; Web. v. Bosse l. c. p. 294; De Toni Syll. I. p. 453. — *Fucus plumaris* Forsk. Flor. aegypt. p. 190.

f. **longipes** Web. v. Bosse l. c. p. 295. — *C. plumaris* v. *longipes* J. Ag. Alg. Syst. I. p. 15. — *Fucus taxifolius* Turn. Hist. t. 54. non Vahl.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: In all tropical Seas.

8. **C. Freycinetti** Ag. Spec. p. 446; sens ampl. Web. v. Bosse l. c. p. 310.

var. **typica** Web. v. Bosse l. c. p. 312.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Guadeloupe; Red Sea; warm Pacific.

var. **pectinata** Web. v. Bosse l. c. p. 316[1]).

A fragment only.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Guadeloupe.

[1]) The determination of this fragment I owe to the kindness of Mad. Weber v. Bosse.

9. **C. Urvilliana** Mont. Voy. Pôle Sud. p. 21, sens. ampl. Web. v. Bosse l. c. p. 318.

var. **typica** f. **tristicha** Web. v. Bosse l. c. p. 319.

C. Urvilliana is by forms narrowly connected with *C. Freycinetti;* I think our only fragmentary specimen is to be referred to *C. Urvilliana*, because there are three rows of teeth on one part of the frond.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area (f. *tristica*): Lucipara Islds.; Trop. Australia; Carolines Islds.

10. **C. racemosa** (Forsk.) J. Ag. Alg. Syst. I. p. 35; sens. ampl. Web. v. Bosse l. c. p. 357. — *Fucus racemosus* Forsk. Flor. aegypt. p. 191.

var. **uvifera** Web. v. Bosse l. c. p. 362.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: W. Indies; Red Sea; Warm Pacific.

11. **C. peltata** Lamx. Journ. de Bot. t. 3. fig. 2; sens. ampl. Web. v. Bosse l. c. p. 373.

The diameter of the disk varies in our plant from 3 to 8 mm.

Koh Chick, on rocks in shallow water.

Area: W. Indies; Red Sea; Warm Pacific.

12. **C. sedoides** (R. Br.) Ag. Spec. p. 438; Web. v. Bosse l. c. p. 387; De Toni Syll. I. p. 480. — *Fucus sedoides* R. Br. in Turn. Hist. t. 172.

The specimen is perhaps allied to f. *crassicaulis*.

Koh Kahdat, in shallow water (coral-sand).

Area: Australia; N. Zealand; Samoa-, Tonga-, Friendl. Islds.

13. **C. lentillifera** J. Ag. Alg. Rueppel. p. 173; sens. ampl. Web. v. Bosse l. c. p. 380.

var. **longistipitata** Web. v. Bosse in herb.[1]).

„Cette variété se distingue du *C. lentillifera typica* par, quelquefois, le petit nombre de ses rangées de vésicules, par le grand diamètre de celles-çi et le pédicelle dont la hauteur égale, ou surpasse la moitié du diamètre de la vésicule.

Quelques échantillons de cette variété ressemblent beaucoup, à première vue, au *C. racemosa* var. *clavifera*, mais ils se distinguent par le rétrécissement du pédicelle à son sommet de tous les échantillons de cette variété". Web. v. Bosse in litt.

Koh Chick, on rocks in shallow water.

Area (var. *longistipitata*): New Guinea; Sarasa (iles Postillon); Tuab (ile de Key).

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[1]) Mad. Weber v. Bosse was so kind to determine this Alga and to give me the following notices.

Codiaceae.

Halimeda Lamx.

14. **H. macroloba** Decne. Corall. p. 91; De Toni Syll. I. p. 520.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Red Sea; Indian and Pacific Oceans.

Udotea Lamx.

15. **U. flabellata** Lamx. Polyp. flex. p. 311 t. 12; De Toni Syll. I. p. 510.

The Pacific specimens seem to be a little more elongated and more deeply split than the plants from the W. Indies; any other difference is not to be seen.

Off Koh Kam, in 10 fathoms water.

Area: W. Indies; Ceylon; Tropic. Australia.

16. **U. glaucescens** Harv. List Friendl. Isl. Alg. Nr. 82; De Toni Syll. I. p. 505.

A fragment only.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Friendl. Islds.

Avrainvillea Decne.

17. **A. papuana** (Zan.) Murr. et Bood. Avrainv. in Journ. of Bot. 1889; De Toni Syll. I. p. 514. — *Chloroplegma papuanum* Zan. Phyc. papuan. Nr. 10 in N. Giorn. Bot. Ital. X. 1878.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: N. Caledonia; N. Guinea; Ceylon; Philippines.

18. **A. comosa** (Bail. et Harv.) Murr. et Bood. l. c.; De Toni Syll. I. p. 515. — *Chlorodesmis comosa* Bail. et Harv. in Harv. Ner. boreal. Americ. III. p. 29. (?)

Undeveloped fragment only, therefore doubtful as to species.

Off Koh Kam, in 10 fathoms water.

Area: Warm Pacific (not uncommon).

Valoniaceae.

Dictyosphaeria Decne.

19. **D. favulosa** (Mert.?) Dcne Classif. alg. p. 32; De Toni Syll. I. p. 371. — *Ulva favulosa* Mert. msc.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Warm Atlantic, Indian and Pacific Oceans.

Valonia Ginn.

20. **V. utricularis** Ag. Spec. p. 431; De Toni Syll. I. p. 376. — *V. utricularis* f. *aegagropila* Hauck Meeresalg. p. 469. — *V. aegagropila* Ag.

With Hauck l. c. I consider *V. aegagropila* only a form of *V. utricularis*.

Koh Kahdat, on coral-reefs in shallow water.

Area: Mediterranean; Atlantic; Indian and Pacific Oceans.

21. **V. Forbesii** Harv. Alg. Ceyl. exsicc. N. 75; De Toni Syll. I. p. 374.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Indian Ocean; warm Pacific.

Struvea Sond.

22. **St. delicatula** Kg. Tab. phyc. XVI. p. 1 t. 2; Murr. et Bood. Struvea. p. 281, Nr. 6; De Toni Syll. I. p. 366. — *Cladophora anastomosans* Harv. Mar. Bot. W. Austr. Nr. 39. Alg. aust. exsicc. Nr. 582.

Little plant and fragments only, which are however characteristic enough.

Koh Lom, on coral-reefs in shallow water.

Area: Guadeloupe; Ceylon; Australia, N. Caledonia.

Siphonocladus Schmitz.

23. **S. Zollingeri** (Kg) Born. in Hariot in Jour. Bot. 1887, p. 56; De Toni Syll. I. p. 358. — *Cladophora (Aegagropila) Zollingeri* Kg. Spec. p. 415, Tab. phyc. IV. t. 64.

Off Koh Kahdat, in 5 fathoms water (coral-sand).

Area: Java.

Boodlea Murr. et De Toni in Journ. Linn. Soc. Bot. XXV.

24. **B. (coacta var?) Siamensis** Reinb. u. sp.

B. intricata, subspongiosa; filamentis primariis paullulum laxe ramosis, ramis dense divaricatimque quoquoversum ramulosis; ramulis hinc illinc ope tentaculorum inter se cohaerentibus; articulis longitudine valde inaequalibus, primariis ad 200 μ, ramulorum c. 30—40 μ crassis, articulis terminalibus apice obtusis; articulis primariis saepe elongatis usque 20plo diametro longioribus.

This is a true *Boodlea* and, as I think, a good species nearly related to *B. coacta,* but which by other algologists may perhaps be considered only a variety of the latter.

Our plant differs from *B. coacta* — of which I have a specimen from *Japan* (leg. Okamura) beside me for comparison — by somewhat less compact and less sponge-like habit, as the primary filaments, provided in part with much elongated joints, are not so densely beset with main branches. The density however of the branches of the second order and

of branchlets is almost the same in both plants, but the latter are in our plant much more spreading. As to the tentacula they are quite evident in *B. Siamensis,* but they seem to occur less numerously than in *B. coacta.* The joints in the different parts of the frond of *B. coacta* are tolerably equal in length, while in our plant they generally vary not inconsiderably in length in one and the same part of the frond. Besides the joints of the primary filaments of *B. Siamensis* are thicker than in B. coacta.

By examination of material preserved in alcohol I can confirm the opinion uttered with some caution by Murray, who examined only dried specimens, (of *B. coacta*), that the chromatophores agree wholly with those which Schmitz has described for the genus *Siphonocladus.* (see Engl. u. Prantl. Pflanzf. I. p. 147, fig. 98).

Koh Kahdat, in 1—2 fathoms water (coral-sand.),

Dasycladaceae.

Acetabularia Lamx.

25.* **A. major** v. Mart. O. Asiat. Tange p. 25. t. 4; v. Solms-Laubach Acetabul. in Transact. Linn. Soc. 1895, Nr. 6. — De Toni Syll. I. p. 419.

The splendid well developed plants agree well with this species, except in that the stalks are somewhat longer (up to 10 cm.) than those described and figured by v. Martens which difference is, I think, of no importance.

The disk measures 2 cm. in diameter and the rays vary in number from 70 to 80.

Abundant in the Koh Chang-Strait on rocks, stones, piles etc. between tide-marks.

Area: Siam (Simaharadscha); Timor; N. Guinea.

Phaeophyceae.

Fucaceae.

Sargassum Ag.

26. **S. polycystum** Ag. Syst. p. 304; De Toni Syll. III. p. 103. — *S. brevifolium* Grev.

Koh Kahdat, in 1—2 fathoms water, attached to stones.

Area: Common in the Indian and Pacific Oceans.

Cystoseira Ag.

27. **C. latifrons** Kg. Tab. phyc. X. p. 22, t. 60; De Toni Syll. III. p. 176.

Perhaps the same species as *C. prolifera* J. Ag.

Koh Kahdat, in 1—2 fathoms water, attached to stones.

Area: China; Timor; Tropic. Australia.

Turbinaria Lamx.

28. **T. conoides** Kg. Tab. phyc. X. p. 24, t. 66; Barton, Turbin, in Transact. Linn. Soc. 1891 p. 217, t. 54; De Toni Syll. III. p. 126. — *T. vulgaris* v. *conoides* J. Ag. Spec. I. p. 267.

Koh Kahdat, in 1—2 fathoms water attached to stones; Koh Chang-Strait at Lem Ngob, cast ashore.

Area: Red Sea; Indian and Pacific Oceans.

Sphacelariaceae.

Sphacelaria Lgby.

28a. **Sph. furcigera** Kg. Tab. phyc. V. p. 27, t. 90.

On *Turbinaria*.

Koh Kahdat, in 1—2 fathoms water.

Area: Red Sea; Indian and Pacific Oceans.

Ectocarpaceae.

Ectocarpus Lgby.

29. **E. indicus** Sond. in Zoll. Verz. p. 3; De Toni Syll. III. p. 546. — *E. amicorum* Harv. Alg. Friendl. Isl. Nr. 8.

Plurilocular sporang.

Off Koh Mesan, attached to a floating cocoa-nut.

Area: Warm Pacific (Java; N. Guinea; Friendly Isl.).

30. **E. simpliciusculus** Ag. in Bot. Zeit. 1827, p. 639. var. *Vitiensis* Asken. Gazelle. p. 20. t. 5; De Toni Syll. III. p. 496. (?)

Too fragmentary, therefore doubtful as to species.

Koh Chang Noi, on coral-reef in shallow water.

Area: Fidji Islds.; E. Australia, Sandwich Islds.

Encoeliaceae.

Colpomenia Derb. et Sol.

31*. **C. sinuosa** (Roth) Derb. et Sol. Mém. p. 11, t. 32; De Toni Syll. III. p. 489. — *Encoelium sinuosum* Ag. — *Asperococcus sinuosus* Bory. — *Ulva sinuosa* Roth. Catal. III. p. 327, t. 12.

Koh Chang-Strait at Lem Ngob, Koh Kahdat, cast ashore.

Area: Mediterranean; Atlantic; Red Sea; Indian and Pacific Oceans. (Siam, Simaharadscha).

Hydroclathrus Bory.

32*. **H. cancellatus** Bory Dict. VIII. p. 119; De Toni Syll. III. p. 490. — *Asperococcus cancellatus* Endl. — *Encoelium clathratum* Ag. — *Asperococcus clathratus* J. Ag.

The specimens from the Koh Chang-Strait represent a very fine and delicate form.

Koh Chang-Strait; Koh Kahdat, abundant on rocks and stones between tide-marks.

Area: Atlantic; Red Sea; Indian and Pacific Oceans; Siam (Simaharadscha).

Asperococcus Lamx.

33. **A. fastigiatus** Zanard. Phyc. indic. Pug. p. 134, t. 3. De Toni Syll. III. p. 496.

f. **major** Reinb. n. f.

fronde duplo crassiore et altiore sed minus ramosa quam in forma typica.

I think the present plant cannot be separated from *A. fastigiatus*, but it represents a remarkably robust form. The fronds are (in exsiccatis) about 5 mm. broad but less branched than the type in Zanardini's figure.

For the rest our plant offers the same characteristic features as the main species; the tips of the segments, simple or forked, are rounded and the diameter of the frond is nearly the same in all parts of the plant.

The specimens are provided (at the end of December) with pluriloc. sporangia which are collected in definite sori dispersed over the frond.

Koh Chang-Strait near Lem Ngob, in shallow water.

Area: Sarawak.

Dictyotales.

Dictyotaceae.

Dictyota Lamx.

34. **D. dichotoma** (Huds.) Lamx. in Desv. Journ. II. p. 42; De Toni Syll. III. p. 263. — *Ulva dichotoma* Huds. Flor. angl. p. 476.

Koh Chang-Strait at Lem Ngob, cast ashore.

Area: Common in all temperate and warm Oceans.

35. **D. Barteyresiana** Lamx. Dict. Nr. 17; De Toni Syll. III. p. 262. — *D. cuspidata* Kg. Tab. phyc. IX. t. 80.

The specimens represent in part a somewhat broad form of this very varying species.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: W. Indies; Tropic. Australia; Ceylon (probably more widely distributed in warmer Seas).

36. **D. divaricata** J. Ag. Alg. Syst. V. p. 101; De Toni Syll. III. p. 276. — *D. Barteyresiana* var. *β divaricata* J. Ag. Spec. I. p. 94. — *D. acutiloba* Kg. Tab. phyc. IX. t. 29 non J. Ag.

The specimens are sterile but correspond in all other characters with this species. (They also agree in some manner with *Dictyota indica* Sond. Kg. Tab. phyc. IX. t. 17, a species insufficiently fixed which is cited from Siam by v. Martens).

Koh Chang-Strait at Lem Ngob, cast ashore,

Area: Atlantic; Red Sea.

37. **D. sp.**

Only a single sterile and incomplete specimen; perhaps *D. robusta* J. Ag. Anal. alg. C. I. p. 76. (Australia).

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Haliseris Targ-Tozz.

38. **H. polypodioides** (Desf.) Ag. Spec. I. p. 142; De Toni Syll. III. p. 254. — *Dictyopteris polypodioides* Lamx. — *Fucus polypodioides* Desf. Flor. atl. II. p. 421.

Between Koh Mesan and Cape Liant, in 9 fathoms water.

Area: Mediterranean; Warm Atlantic; Cape; Red Sea; Pacific. (Australia, Japan).

Padina Adans.

39. **P. Commersonii** Bory Voy. Coq. Nr. 41, t. 21; J. Ag. Alg. Syst. V. p. 119; De Toni Syll. III. p. 244.

Among the present great number of specimens some are provided with oospores and belong surely, I think, to this species, but it is probable, that among the sterile plants there may be specimens of the widely distributed *Padina pavonia*.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: W. Indies; Red Sea; Tropic. Australia; Ceylon; N. Guinea; Japan.

Zonaria (Gymnosorus) J. Ag.

40. **Z. sp.**

Decumbent little crustaceous patches attached to stones and one little unattached sterile specimen. All show the structure of *Zonaria (Gymnosorus)*. Judging by their mode of growth the specimens probably represent young states of *Zonaria Diesingiana* J. Ag. or *Zonaria (Gymnosorus) variegata* (Lamx.), which both occur in the Pacific. (Or should our plant perhaps be identical with *Zonaria obscura* Dick., a doubtful species shortly described in Dickie, Alg. Mangaia Isl. in Journ. Linn. Soc. 1875, p. 31?).

Rhodophyceae.

Bangiales.

Bangiaceae.

Erythrotrichia Aresch.

41. **E. ceramicola** (Lgby.) Aresch. Phyc. Scand. p. 210; De Toni Syll. IV. p. 24. — *Bangia ceramicola* Chauv. — *Goniotrichum ceramicola* Kg. — *Conferva ceramicola* Lgby. Hydroph. Dan. p. 144, t. 48.

On *Padina* and *Laurencia*.

Koh Chang-Strait at Lem Ngob, on rocks between tide-marks.

Area: Mediterranean; Atlantic; Cape Horn; Timor; Tonga Isls.

Florideae.

Gelidiaceae.

Gelidium Lamx.

42. **G. crinale** (Turn.) Lamx.; De Toni Syll. IV. p. 156; *G. corneum* var. *crinalis* Auct. J. Ag. Spec. II. p. 470. — *Fucus crinalis* Turn. Hist. t. 198.

The specimen agrees in its habit with *Acrocarpus intricatus* Kg. Tab. phyc. XVIII. t. 35.

Koh Chang Noi and Koh Lom, creeping on coral-reefs in shallow water.

Area: Mediterranean; Atlantic; Red Sea; Pacific.

Rhodophyllidaceae.

Catenella Grev.

43. **C. Nipae** Zan. Phyc. indic. Pug. Nr. 35, t. 6; De Toni Syll. IV. p. 321.

Koh Chang-Strait at Lem Ngob, creeping on the roots of mangrove-trees between tide-marks.

Area: Sarawak.

Rhabdonia Harv.

44. **R. Schmidtii** Reinb. n. sp. (Fig. 1—5).

R. gelatinoso-membranacea, caespitosa, decumbens e teretiusculo compressa, $^1/_2$—2 mm. lata, dichotome et parce inordinateque lateraliter ramosa, frondes (et segmenta cujusque frondis) et inter se et cum aliis corporibus ope processuum hinc illinc arcte concrescentes; segmentis saepe $\pm$ elongatis marginibus paullulum inaequalibus (sparsim leviter constrictis et dilatatis) apicibus obtusis vel subacutis, prolificationibus et processibus difformibus, plerumque $\pm$ minutis, e marginibus vel rarius e disco emergentibus, praecipue versus apices et ad apices obsitis. Tetrasp. generis

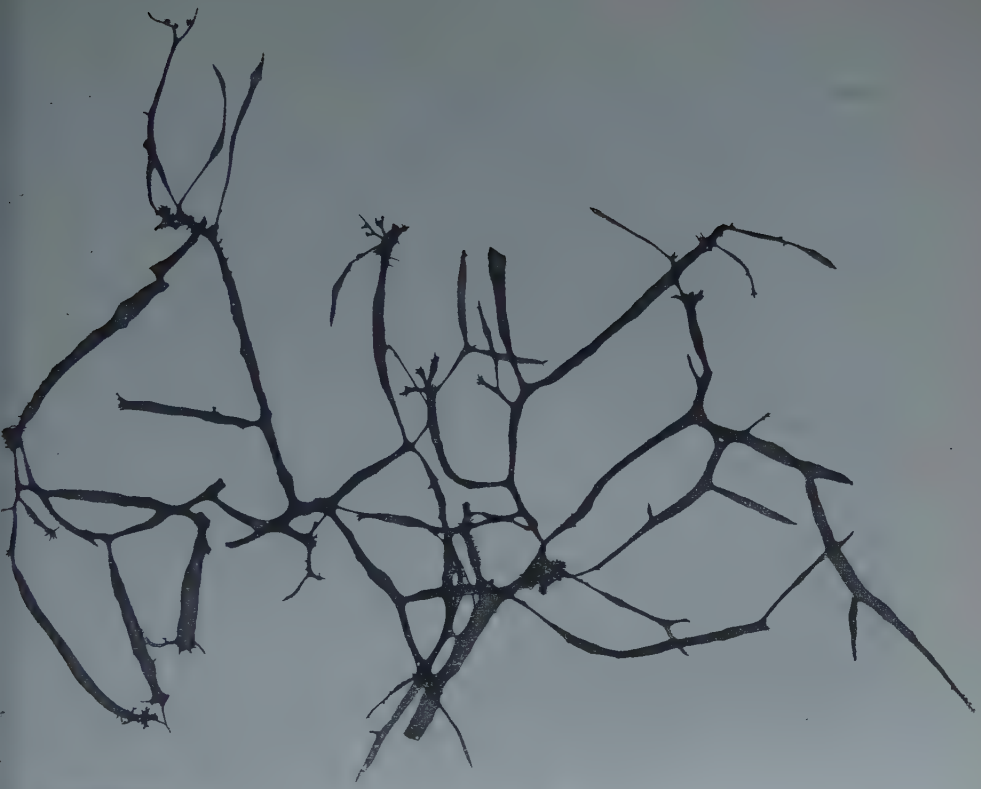

Fig. 1.

Fig. 2.

Fig. 4.

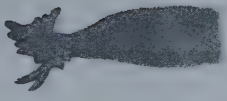

Fig. 5.

Fig. 3.

Fig. 1—5. *Rhabdonia Schmidtii.*

1. Fronds; nat. size. — 2—5 show the various forms of the excrescences growing out from the margins and the tips of the frond. 7: 1. (Dr. A. Voigt del. Figg. 2—5.)

(zonatim divisis) per frondem sparsis. Cystocarpiis ? ? — Chartae adhaeret.

The plant represents a true *Rhabdonia* by the structure of the frond, characteristic for this genus, together with the zonate tetraspores. Of all the known species of *Rhabdonia* the new species seems to be most nearly related to *R. decumbens* Grun. (Asken. Gazelle p. 46, t. 2). Even on reading the somewhat short diagnosis I had at first the conjecture, that the two plants, although living in very distant places of the world, were identical, but after having examined the figures of *R. decumbens,* I was convinced of the impossibility of uniting the two plants under one specific name.

Our specimens are so intricated and in part so closely attached one to the other and also to small grains from the ground (pieces of shells etc.), that it is very difficult and often even impossible to separate the fronds without injury or to make a preparation of an uninjured complete specimen. In the figures I have attempted to show the habit of the plant, but it would require a great number of figures to give a complete idea of the great variety in branching and of the diverse arrangements of the prolifications and excrescences. These latter growing out from the margin or the tips of the segments (or of the prolifications) and more seldom from the flat surface, are also of a very varying form, sometimes they are like warts or little cushions, then they resemble little teeth or roundish, simple or forked cilia, or more elongated and variously divided ones, which fringe the margins or terminate the tips of the segments. (Figg. 2—5 represent some different forms of the excrescences). The frond is not strictly articulated (as in *R. clavigera, R. verticillata*) but it is in part and in an irregular manner slightly constricted and dilatated alternately, so as to make sometimes the margins of the frond unequal. The consistence of the frond is somewhat gelatinous so that the plant adheres firmly to the paper. I have not seen cystocarps.

Koh Chang-Strait, in shallow water near Lem Ngob.

Sphaerococcaceae.

Gracilaria Grev.

45. **G. confervoides** (L.) Grev. Alg. Brit. p. 123; De Toni Syll. IV. p. 431. — *Fucus confervoides* L. Spec. plant. II. p. 1629.

Off Koh Kam in 10 fathoms water.

Area: Widely distributed throughout all warm Seas.

46. **G. dura** (Ag.) J. Ag. Alg. medit. p. 151; De Toni Syll. IV. p. 442. — *Sphaerococcus durus* Ag. Spec. p. 310.

Area: In almost all warm Seas.

f. **prolificans** Reinb. n. f.

fronde admodum crassa, ramis et ramulis basi eximie constrictis, prolificationibus evidenter petiolatis ex apicibus truncatis ramorum (fere flabellatim) egredientibus.

The specimens show the structure and the other characteristic points of *Gracilaria dura*, a species much varying in its habit; but I think our plant represents a very distinct form, which should be fixed. In general, prolifications occur rarely in the genus *Gracilaria*.

The specimens, provided with cystocarps, are somewhat stout and robust, about 10 cm. high and about $1-1^1/_2$ mm. thick (in diameter).

Koh Chang-Strait, in shallow water near Lem Ngob.

Hypnea Lamx.

47. **H. musciformis** (Wulf.) Lamx. Ess. p. 43; De Toni Syll. IV. p. 472. — *Fucus musciformis* Wulf. in Jacq. Coll. III. p. 154, t. 14. Fig. 3.

A small but fruiting (tetrasp.) specimen.

Koh Chang-Strait at Lem Ngob, in sandy ground between tide-marks.

Area: In all warm Seas.

Champia Desv.

48. **Ch. parvula** (Ag.) J. Ag. Epic. p. 303; De Toni IV. p. 558. — *Lomentaria parvula* Gaill. — *Chylocladia parvula* Hook. — *Chondria parvula* Ag. Syst. p. 207.

The (sterile) specimen agrees in its habit with *Lomentaria parvula β. vaga* Kg. Tab. phyc. XV. t. 87.

4 miles S. of Koh Saket, in 9 fathoms water (shells).

Area: Mediterranean; Atlantic; Australia; Japan.

Caloglossa (Harv.) J. Ag.

49. **C. mnioides** Harv. Alg. exsicc. Friendl. Isl. Nr. 33; J. Ag. Epic. p. 500; De Toni Syll. IV. p. 729. — *Hypoglossum Vieillardi* Kg. Tab. phyc. XVI. t. 10.

Very young specimens only, therefore somewhat doubtful as to species.

15 miles E. of Koh Chuen, in 10 fathoms water (shells.).

Area: N. Guinea; N. Caledonia; Friendl. Islds.; Ceylon. ?

Laurencia Lamx.

50. **L. divaricata** J. Ag. Spec. II. p. 754.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Red Sea; Indian and Pacific Oceans.

51. **L. dendroidea** J. Ag. Spec. II. p. 753.

Koh Kahdat, cast ashore.

Area: Warm Atlantic; Pacific (Australia, Japan).

52. **L. obtusa** (Huds.) Lamx. Ess. p. 42; J. Ag. Epic. p. 653. — *Fucus obtusus* Huds. flor. angl. p. 586.

Some of the present specimens agree tolerably with var. *squarrulosa* Grun. Alg. Fidji-Samoa Islds. p. 23. (from Tongatabu).

Koh Chang-Strait at Lem Ngob, on rocks between tide-marks.

Area: Widely distributed in all warm Oceans.

Acanthophora Lamx.

53*. **A. orientalis** J. Ag. Spec. II. p. 820.

The specimen from Lem Ngob is sterile, therefore doubtful, but I have seen some little fertile fragments between Algæ from Koh Kahdat which certainly belong to this species.

Lem Ngob, Koh Kahdat in shallow water.

Area: Manila; Samoa-Tonga-Marianes Isls.; (Siam? sub nomine A. Thieryi).

Polysiphonia Grev.

54. **P. scopulorum** Harv. Mar. Bot. W. Aust. Nr. 88; J. Ag. Spec. II. p. 940.

On stones.

Koh Chang Noi, on coral-reef in shallow water.

Area: W. Australia.

Tolypiocladia Schmitz.

55. **T. glomerulata** (Ag.) Schm. in Engl. u. Prantl. Pfl. fam. p. 441. — *Polysiphonia glomerulata* (Ag.) J. Ag. Spec. II. p. 1016. — *Polysiphonia calodictyon* Harv.; *Polysiphonia calacantha* Harv. — *Hutchinsia glomerulata* Ag. Syst. p. 158.

Koh Kahdat, Koh Chang Noi, on coral-reefs in shallow water.

Area: Indian and Pacific Oceans.

Leveillea Dcne.

56. **L. jungermannioides** (Mart. et. Her.) Harv. Mar. Bot. W. Aust. p. 539. — *L. gracilis* Dcne. — *Polyzonia jungermannioides* (Mart. et. Her.) J. Ag. Spec. II. p. 1169. — *Amansia jungermannioides* Mart. et Her. in Flora 1836 p. 485.

Koh Chang Noi, Koh Lom, on coral-reefs in shallow water.

Area: Red Sea; Indian and Pacific Oceans.

Ceramiaceae.

Ceramium (Roth) Lgby.

57. **C. fastigiatum** Harv. in Hook. Journ. Bot. p. 303; J. Ag. Epic. p. 96; Anal. alg. Cont. II. p. 16.

The specimens are provided with tetraspores (exteriore latere ramulorum prorumpentibus).

Off Tung Kaben, in 6 fathoms water (mud).

Area: Mediterranean; Atlantic; Australia?

58. **C. Kützingianum** Grun. Alg. Samoa, Fidji Isl. p. 9. — *Gongroceras subtile* Kg. Tab. phyc. XIII. t. 2 (non *Ceramium subtile* Ag.).

Fragments of this species, one of the finest and most delicate of the genus often occur epiphytically on other Algæ in our material.

Koh Chang Noi, on coral-reef in shallow water; between Koh Mesan and Cape Liant, in 9 fathoms water.

Area: Samoa Isl.; N. Caledonia; Sandwich Isls.

Spyridia Harv.

59. **S. filamentosa** (Wulf.) Harv. in Brit. Fl. p. 336; J. Ag. Epic. p. 268. — *Fucus filamentosus* Wulf. Crypt. aq. p. 64.

Koh Kahdat, in 1—2 fathoms water (coral-sand); off Koh Kam, in 10 fathoms water (gravel).

Area: Widely distributed in all warm and temperate Seas.

Grateloupiaceae.

Cryptonemia.

60. **C. sp.**

The little specimen is too much torn and incomplete to be determined exactly as to species.

Between Koh Mesan and Koh Chuen, in 15 fathoms water (stones).

Squamariaceae.

Peyssonnellia Decne.

61. **P. Gunniana** J. Ag. Epic. p. 387. — *P. rubra* Harv. alg. austr. exsicc. Nr. 327.

Koh Chang Noi, on coral-reef in shallow water.

Area: Australia.

62. **P. rubra** (Grev.) J. Ag. Spec. II. p. 502. — *Zonaria rubra* Grev. in Transact. Linn. Soc. XV. p. 340.

Between Koh Mesan and Koh Chuen, in 15 fathoms water (stones).

Area: Mediterranean; Atlantic; Red Sea; Ceylon; Australia; Tonga Islds.

The *Corallinaceae* by M. Foslie have already been published in part II. of the „Flora of Koh Chang", Botanisk Tidsskrift, vol. 24, fasc. 1, p. 15—22.

Myxophyceae hormogoneae

by **M. Gomont** — Paris.

(With plate 5.)

Peu de travaux ont été publiés jusqu'ici sur les Algues de la partie Sud-Est de l'Asie, et les Myxophycées n'y sont représentées en général que par un nombre infime d'espèces [1]). Quant à la région même explorée par l'Expédition danoise et à la partie du continent qui l'avoisine, nous ne pensons pas qu'aucun Algologue l'ait jamais visitée. Les matériaux récoltés au cours de l'Expédition danoise de 1899—1900 dans le golfe de Siam méritaient donc d'être étudiés avec attention. S'ils ne nous ont fourni, que 27

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[1]) Voici les seuls renseignements que nous a fourni à cet égard la littérature. Encore les territoires mentionnés dans les travaux ci après sont ils presque tous assez éloignés de la localité qui nous occupe.

G. von Martens — Die preussische Expedition nach Ost-Asien, Botanischer Theil, die Tange, Berlin 1866. L'expédition a visité Java, Singapore, Siam, Macao, Hongkong, les Philippines et Macassar. L'ouvrage mentionne six Nostocacées seulement, des mers de la Chine et des îles de la Sonde — List of Algæ collected by Kurz in Burma; in Proceedings of Asiatic Society of Bengal, p. 462, 1871.

Zanardini, Phycearum indicarum pugillus a d. Ed. Beccari ad Borneum, Singapore et Ceylonum, annis 1865—67 collectarum, in Mem. R. Istituto veneto vol. XVII, 1872.

Quinze Anhomocystées et dix Homocystées figurent dans ce travail. Elles proviennent de Singapore, Ceylan et Sarawak dans l'île de Borneo.

Zeller, Algæ collected by M. Kurz in Arracan and British Burma, in Journ. Asiatic Soc. of Bengal, vol. XLII, part II, p. 165, 1873.

La liste donnée par l'auteur comprend 24 Homocystées et 36 Anhomocystées.

Heydrich, Beiträge zur Kenntniss der Algenflora von Ost-Asien, in Hedwigia, Band XXXIII, p. 267, 1894.

Ce travail comprend les îles Formose, Liukiu, Bonin et deux des Moluques. Trois espèces de Nostocacées seulement sont indiquées dont une est indéterminée.

Des ouvrages beaucoup plus importants ont été publiés récemment par M. de Wildeman sur les Indes Néerlandaises, mais ces îles ne sont généralement pas considérées comme appartenant à l'Asie.

espèces de Nostocacées hormogonées, il est à remarquer que, sur ce nombre, il s'en est réncontré deux nouvelles parfaitement caractérisées.

Ces 27 espèces se répartissent entre 13 genres, dont 6 appartiennent aux Homocystées et 9 aux Anhomocystées. Si on examine le catalogue que nous en donnons, on s'aperçoit immédiatement que les Algues à gaines épaisses et colorées l'emportent de beaucoup par le nombre des espèces et par leur fréquence. Ainsi, tandis que les genres *Oscillatoria, Lyngbya, Phormidium, Hydrocoleum* ne sont représentés chacun que par une espèce, les *Scytonema* et *Stigonema* en renferment treize à eux seuls. Deux *Schizothrix* seulement se trouvent, il est vrai, mentionnés sur notre liste, mais le *S. thelephoroides*, qui est pourvu d'une enveloppe remarquablement épaisse et ferme a été récolté dans six localités différentes. On a donc des raisons de croire qu'il abonde dans la région [1]).

Cette pénurie d'Algues à gaines minces ou molles peut n'être qu'apparente et résulter du moment où s'est faite l'exploration qui a eu lieu pendant la saison sèche, c'est à dire à une époque où les flaques d'eau peu profondes avaient disparu, ainsi que leurs hôtes habituels. Or c'est là surtout que se rencontrent les plantes insuffisamment protégées par leurs enveloppes, comme les *Oscillatoria, Phormidium, Nostoc, Anabœna* etc. Notons cependant que les rochers éclaboussés ou baignés par les cours d'eau permanents sont aussi l'habitat des espèces dont l'absence nons a frappé.

On pourrait conclure de cette dernière remarque que cette absence n'est pas purement accidentelle mais que, ainsi qu'on l'a maintes fois observé, les plantes les mieux adaptées aux régions tropicales sont celles qui trouvent dans l'épaisseur, la consistance ou la coloration de leur gaine une protection contre les sécheresses fréquentes et l'intensité de la lumière.

Les données que nous avons pu réunir sur l'aire d'habitation des espèces ont été indiquées dans le catalogue qui suit. Il ne faudrait pas cependant s'en exagérer l'importance. Bien que les recherches aient été poussées assez activement dans cette direction

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[1]) Ce n'est pas sans quelque étonnement que j'ai constaté l'absence du *Porphyrosiphon Notarisii* dans les spécimens soumis à mon examen. Cette Homocystée, dont les gaines sont épaisses et fortement colorées, se rencontre en effet fréquemment dans toutes les régions chaudes. Elle a été notamment récoltée dans l'Inde par Kurz et Bélanger et à Ceylan par Ferguson.

depuis que la systématique des Myxophycées est devenue plus précise, il reste encore beaucoup à faire. Les observations que je présentais il y a huit ans, dans la *Monographie des Oscillariées*, sur l'état incomplet de nos connaissances géographiques sont encore vraies en grande partie et, même en Europe, de vastes territoires sont restés jusqu'à présent inexplorés [1]).

Myxophyceæ Stizenberger.

Hormogoneæ Thuret.

Homocysteæ Bornet et Flahault.

Lyngbyeæ Hansgirg (extensæ).

Oscillatoria Vaucher.

1. **O. tenuis** Agardh.

Alg. Dec. II, p. 25, 1813.

var. *α* **natans** Gomont, Monogr. des Oscill., in Ann. des Sc. nat., VII[e] Série, Bot., t. 16, p. 221, Pl. VII, fig. 2 et 3 — *O. natans* Kütz., Alg. aq. dulc. Dec., IV, n° 34.

Waterhole near Lem Ngob.

Aire géogr.: Grœnland, Suède, Danemark, Pays-Bas, Belgique, France, Allemagne, Hongrie, Italie, Afrique boréale et équatoriale, États Unis, Antilles Amérique équatoriale, Sumatra, Nouvelle Zélande, Nouvelle Calédonie.

Trichodesmium Ehrenberg

2. **T. Hildebrandtii** Gomont.

Loco cit. p. 197, Pl. VI, fig. 1 — *T. Ehrenbergii*, forma *indica* Hauck, Ueber einige von J. M. Hildebrandt im Rothen Meere und Indischen Ocean gesammelten Algen, in Hedwigia, vol. XXVII, Heft 4, p. 93.

Abundant in maritime plankton throughout the area explored.

Aire géogr.: Ceylan, Singapore, Cap S[t] Andréas (Ile de Madagascar).

[1]) Pour l'indication des aires géographiques j'ai seulement tenu compte des données qui présentaient un certain caractère d'authenticité. On sait en effet, qu'en l'absence d'échantillons originaux les déterminations ne doivent être acceptées qu'avec beaucoup de réserve, surtout chez les anciens auteurs.

Phormidium Kützing.

3. **P. inundatum** Kützing.

Spec. Alg., p. 251, 1849 — Gomont, loco cit. p. 172, Pl. IV, fig. 31 et 32.

Waterhole near Lem Ngob.

Aire géogr.: France occidentale, Belgique, Saxe, Mont Cameron (Afrique équatoriale), États Unis, Guyane, Nouvelle Zélande.

Lyngbya Agardh.

4. **L. majuscula** Harvey.

In Hooker, Engl. Fl., V, part 1, p. 370, 1833 — Gomont, loco cit. p. 131, Pl. III, fig. 3 et 4.

Mangrove-swamp near Lem Dan on aërial roots of *Rhizophora conjugata* between tide-marks.

Aire géogr.: Norvège, Danemark, côtes de la Manche, côtes orientales et occidentales de l'Atlantique, Mer Méditerranée, Adriatique, Mer Rouge, Mer des Indes, Océan Pacifique.

Vaginarieæ Gomont.

Hydrocoleum Kützing.

5. **H. lyngbyaceum** Kützing.

Spec. Alg., p. 259, 1849 — Gomont, Monogr. des Oscill., in Ann. des Sc. nat., VII[e] série, Bot., t. 15, p. 337, Pl. XII, fig. 8 à 10.

var. β **rupestre** Kützing, loco cit.

Mangrove-swamp near Lem Ngob, forming black, shining patches on the muddy ground and on aërial roots of *Avicennia officinalis*.

Aire géogr. Mer du Nord, Mer Baltique, Manche, Mer Méditerranée sur les côtes de France, d'Algérie et de Syrie, Océan Atlantique sur les côtes de France, d'Espagne, des Etats Unis et aux Bermudes, Ile Maurice, Borneo.

Schizothrix Kützing (emend.).

Subgen. Chromosiphon Gomont.

6. **S. Lamyi** Gomont.

In Bornet, Algues du département de la Haute-Vienne contenues dans l'herbier Lamy de la Chapelle, in Bull. de la Soc. bot. de France, t. XXXVIII, p. 250, 1891; Monogr. des Oscill., loco cit., p. 323, Pl. XI, fig. 1 à 3.

With *Schizothrix thelephoroides* on wet rocks in the jungle near Klong Munsé.

Aire géogr.: France centrale, Nouvelle Zélande.

7. **S. thelephoroides** Gomont.

Monogr. des Oscill., loco cit. p. 319, Pl. X, fig. 1 à 4.

Abundant on rocks in the jungle near Klong Munsé.

Aire géogr.: Ceylan, Brésil, Porto Rico.

Anhomocysteæ Gomont.

Sur quelques Oscillariées nouvelles, in Bull. de la Soc. bot. de France, t. XLVI, p. 33, 1899.

Heterocysteæ Hansgirg, Bemerk. zur System. einig. Süsswasseralgen, p. 9, 1884 — Bornet et Flahault, Revision des Nostocacées hétérocystées, in Ann. des Sc. nat., VII[e] série, Bot., t. 3, p. 337.

Nostoceæ Kützing.

Nodularia Agardh.

8. **N. spumigena** Mertens.

var. *β*, **litorea**, Bornet et Flahault in Ann. des Sc. nat., VII[e] série, Bot., t. 7, p. 246.

Bien que l'échantillon soit stérile, on ne peut, à cause du diamètre du trichome (15 *μ*), l'attribuer à une autre espèce que le *N. spumigena*. Il ne nous a d'ailleurs paru différer en rien des échantillons types de la forme *litorea*; cependant l'absence de spores nous empêche d'être absolument affirmatif sur ce dernier point.

Koh Kong, on the sandy sea-shore between tide-marks.

Aire géogr.: Suède, Mer Baltique et Mer du Nord, Pays Bas, Angleterre. Marais salans et d'eau douce de la France et de l'Allemagne.

Scytonemaceæ Rabenhorst.

Desmonema Berkeley et Thwaites.

9. **D. Wrangelii** Bornet et Flahault, Rev. des Nostoc. hétér., in Ann. des Sc. nat., VII[e] série, Bot., t. 5, p. 127, 1887.

Thorea Wrangelii Agardh, Disp. Alg. Suec., p. 40, 1812.

Dans la plante adulte, les gaines renferment souvent plusieurs trichomes; il n'en est pas de même lorsqu'elle est peu développée, comme c'est ici le cas. L'échantillon ne peut cependant être confondu avec un *Tolypothrix*, les ramaux étant agglutinés le long du filament principal, ce qui n'a jamais lieu dans ce dernier genre. De plus, dans le plante siamoise, les hétérocystes sont à parois minces et peu différenciés, ce qui est également un caractère du genre *Desmonema* où ils manquent quelquefois (conf. Bornet et Flahault, loco cit.).

Jungle near Klong Sarlakpet (alt. 700 ft.), on rocks in a waterfall.

Aire géogr.: Europe septentrionale et occidentale, Allemagne, Italie, États Unis, Bolivie.

Scytonema Agardh.

10. **S. mirabile** Bornet.

Les Nostocacées hétérocystées du Systema Algarum d'Agardh, in Bull. de la Soc. bot. de France, t. XXXVI, p. 155, 1889.

Conferva mirabilis Dillwyn, Brit. Conf., tab. 96, 1809.

Scytonema figuratum Bornet et Flahault, Revision des Nostocacées hétérocystées, loco cit., p. 101.

On dry rocks in the jungle near Klong Munsé.

Aire géogr.: Europe, Amérique du Nord, Indes orientales, Cochinchine, Ile Bourbon, Nouvelle Calédonie, Iles Sandwich.

11. **S. Hofmanni** Agardh.

Synops. Alg. Scand. p. 117, 1817 — Bornet et Flahault, loco cit. p. 97.

Common in the jungle all over Koh Chang, epiphytic on ferns and other low plants and also on rocks.

Aire géogr.: Europe, Indes orientales, Cochinchine, Ile Maurice, Amérique du Nord, Antilles, Terre de Feu, Tahiti.

12. **S. ocellatum** Lyngbye.

Hydrophyt. dan. p. 97, tab. 28, A, 1819. — Bornet et Flahault, loco cit. p. 95.

Lem Dan on the stem of Cocoa-palms; jungle near Klong Munsé, on rocks.

Aire géogr.: Europe, Indes orientales, Ceylan, Cochinchine, Afrique, Madère, Amérique de Nord, Antilles, Bermudes, Guyane, Brésil, Iles Borneo, Sandwich et Marquises.

13. **S. Schmidtii** Gomont, n. sp. (Pl. V, fig. 1 à 4.)

Stratum extensum, fusco-nigrum, crustaceo-tomentosum, ad millimetrum crassum, superficie sulcatum. Fila eximie et subregulariter undulata, crispa, arcte intricata, 10—12 μ, inferne usque ad 16 μ crassa, primaria repentia stoloniformia, abundanter et repetite pseudoramosa, pseudoramis patentibus; vaginæ luteo-fuscæ, inferne crassæ et rugosæ, chlorozincico iodurato haud cærulescentes. Trichomata eximie torulosa, æruginosa, 9—12 μ crassa; articuli sæpius compressi, passim subquadrati, 2—6 μ longi — Heterocystæ quadratæ vel compressæ, achromaticæ (v. s.).

Les gaines homogènes de cette plante la placent dans la section *Euscytonema* Bornet et Flahault. Elle nous paraît voisine des *S. javanicum* et *ocellatum*. Sa croissance en gazons uniformes, sans fascicules, la sépare du *S. javanicum*; ses filaments crépus, ses articles généralement plus courts que ceux du *S. ocellatum* et ses trichomes fortement toruleux la distinguent nettement de cette dernière espèce.

Open ground near Lem Dan, on lime-stones.

14. **S. javanicum** Bornet.

In Bornet et Thuret, Notes Algologiques p. 148, 1880 — Bornet et Flahault, loco cit., p. 95.

Lem Dan, on trees and rocks near the Sea; Klong Son, on trees in the jungle.

Aire géogr.: Ceylan, Jamaïque, Guyane, Brésil, Java, Iles Sandwich.

15. **S. Guyanense** Bornet et Flahault.

Loco cit. p. 97, 1887.

Lem Dan on trees near the Sea; jungle near Klong Munsé, on rocks.

Aire géogr.: Ceylan; Amérique du Nord, Antilles, Brésil, Guyane, Vénézuela, Honolulu.

16. **S. crispum** Bornet.

Les Nostocacées hétérocystées du Systema Algarum de C. Agardh, in Bull. de la Soc. bot. de France, t. XXXVI, p. 156, 1889.

S. cincinnatum Thuret, Essai de class. des Nostochinées, in Ann. des Sc. nat., 6e sér., Bot. t. I, p. 380. — Bornet et Flahault, loco cit. p. 89.

With *Stigonema minutum* on rocks in the jungle near Klong Munsé.

Aire géogr.: Suède, Danemark, France centrale et méridionale, Corse, Allemagne, Ile Maurice, Amérique du Nord, Jamaïque, Brésil, Iles de l'Océan Pacifique.

Sirosiphoniaceæ Rabenhorst.

Stigonema Agardh.

17. **S. mamillosum** Agardh.

Syst. Alg. p. 42, 1824. — Bornet et Flahault, loco cit., p. 77.

Lem Dan, on stones in a stream.

Aire géogr.: Norvège, Suède, Angleterre, France, États Unis.

18. **S. informe** Kützing.

Spec. Alg. p. 319, 1849. — Bornet et Flahault, loco cit. p. 75.

Jungle near Klong Munsé, on wet rocks with *Stigonema ocellatum* and *Schizothrix thelephoroides* etc.

Aire géogr.: Angleterre, France, Suisse, Allemagne, Autriche, États Unis, Brésil, Guyane, Java.

19. **S. turfaceum** Cooke.

Brit. Freshwat. Algæ p. 273, 1884. — Bornet et Flahault, loco cit. p. 74.

Jungle near Klong Munsé, on humid rocks in company with *S. minutum*.

Aire géogr.: France, Allemagne, États Unis.

20. **S. minutum** Hassall.

Hist. of the Brit. freshwat. Alg. I, p. 230, pl. 67, fig. III, IV, 1845. — Bornet et Flahault, loco cit. p. 72.

Klong Munsé, on rocks in the jungle; Lem Dan, on stones in a stream.

Aire géogr.: Grœnland, Péninsule Scandinave, Danemark, Angleterre, France septentrionale et centrale, Allemagne, Autriche, États-Unis, Brésil, Iles Sandwich.

21. **S. ocellatum** Thuret.

Essai de classif. des Nostochinées in Ann. des Sc. nat., VI[e] série Bot., t. I, p. 380. — Bornet et Flahault, loco cit. p. 69.

Klong Son and Klong Munsé, on wet rocks in the jungle.

Aire géogr.: Grœnland, Europe septentrionale, occidentale et centrale, États Unis, Antilles, Guyane, Japon, Ceylan, Iles Sandwich, Nouvelle Calédonie Hawai.

22. **S. hormoides** Bornet et Flahault.

Loco cit. p. 68, 1887.

Jungle near Klong Son, epiphytic on the leaves of small herbs.

Aire géogr.: Danemark, France septentrionale et centrale, Allemagne, Suisse, Autriche, Italie, États-Unis.

Hapalosiphon Nägeli.

23. **H. fontinalis** Bornet.

Les Nostocacées hétérocystées du Systema Algarum d'Agardh, in Bull. de la Soc. bot. de France, t. XXXVI, p. 155, 1889.

H. pumilus Kirchner, Kryptogamenflora von Schlesien, Algen p. 231, 1878. — Bornet et Flahault, loco cit. p. 61.

Muddy rice-field near Lem Dan, epiphytic on *Monochoria vaginata*, and in a waterhole among other algæ.

Aire géogr.: Grœnland, Péninsule Scandinave, Danemark, France septentrionale et centrale, Allemagne, États-Unis, Brésil, Iles Sandwich, Indes orientales.

Rivulariaceæ Kützing.

Brachytrichia Zanardini.

24. **B. Quoyi** Bornet et Flahault.

Revision des Nostocacées hétérocystées, in Ann. des Sc. nat. VII[e] série, Bot., t. IV, p. 373, 1886.

Nostoc Quoyi Agardh, Syst. Alg. p. 22, 1824.

Lem Dan, on stones in the sea-shore between tide-mark; Koh Kahdat, coral-reef in shallow water.

Aire géogr.: Océan Atlantique sur la côte des États-Unis; Mer des Indes, Océan Pacifique.

25. **B. maculans** Gomont n. sp. (Planche V, fig. 5 à 7.)

Frondes planæ, crustaceæ, tenues, pagina inferiori rupibus arcte adhærentes, maculas atras, initio orbiculares, deinde confluentes ideoque ambitu irregulares, ad centimetrum et ultra latas formantes, e strato unico filorum compositæ. Trichomata torulosa, recta, parallela, arcte congesta, muco tenaci agglutinata, inferne pseudoramosa, sæpe medio affixa et utrinque erecta, 6—8 μ, basim versus tantummodo 4 μ crassa; articuli irregulares, sæpius subquadrati, inferne longiores; heterocystæ subquadratæ; hormogoniæ ad 70 μ longæ (v. s.).

Tandis que, chez les deux espèces de *Brachytrichia* connues jusqu'ici, les frondes sont globuleuses, le thalle de celle-ci est étalé et aplati, rappelant jusqu'à un certain point celui de l'*Isactis plana*. Le mode de ramification, aussi bien que la place des hétérocystes, qui sont intercalaires et non basilaires, rend d'ailleurs impossible toute confusion avec ce dernier genre.

Les filaments de la plante siamoise sont presque droits, très serrés et parallèles; dans les *B. Balani* et *Quoyi*, ils m'ont paru plus lâches et plus irrégulièrement contournés. Enfin la fronde du *B. maculans* n'est jamais creuse, même dans les parties les mieux développées, ni conformée de manière à le devenir. Ces différences justifient l'établissement de la nouvelle espèce.

Lem Dan. on maritime rocks between tide-marks.

Mastichotricheæ Kützing.

Calothrix Agardh.

26. **C. crustacea** Thuret.

In Bornet et Thuret, Notes algologiques fasc. I, p. 13—16, tab. IV, 1878. — Bornet et Flahault, in Ann. des Sc. nat. VII[e] série, Bot., t. III, p. 359.

Lem Ngob, mangrove-swamp, on aërial roots of *Avicennia officinalis* between tide-marks.

Aire géogr.: Skagerrack, Kattegat, Grande Bretagne, France, Espagne, dans le Golfe de Gascogne, Tanger, mer Méditerranée, Adriatique, États Unis, Antilles, Japon, Iles du Pacifique.

27. **C. scopulorum** (?) Agardh.

Syst. Alg. p. 70, 1824. Bornet et Flahault, loco cit. p. 353.

La plante est trop peu développée pour être déterminée avec certitude.

Lem Dan, on stones in the sea-shore between tide-marks.

Aire géogr.: Océan arctique; Océan Atlantique jusqu'à Tanger et Madère et sur la côte d'Amérique; Méditerranée et Adriatique; Iles St Paul dans l'Océan Pacifique.

Calothrix spec.

Peut-être *C. æruginea* ou *C. scopulorum*.

La plante est trop peu développée pour être déterminée avec certitude.

Lem Ngob and Lem Dan, mangrove-svamp, on stem and aërial roots of *Avicennia officinalis* between tide-marks.

Calothrix spec.

Plante insuffisamment développée. Peut-être le *C. æruginea*.

Lem Ngob, mangrove-swamp, on the leaves of young specimens of *Avicennia officinalis* between tide-marks.

Explication des figures de la planche V.

Fig. 1. — *Scytonema Schmidtii* n. sp. Touffe de filaments. (Grossissement 120 diamètres.)

Fig. 2. — Filament rampant de la même plante portant des rameaux dressés. (Grossissement 288 diamètres.)

Fig. 3. — Extrémité d'un rameau. (Grossissement 550 diamètres.)

Fig. 4. — Deux hormogonies. (Grossissement 288 diamètres.)

Fig. 5. — *Brachytrichia maculans* n. sp. Taches formées sur une pierre par les frondes de la plante. (Grandeur naturelle.)

Fig. 6. — Coupe verticale à travers une fronde. (Grossissement 288 diamètres.)

Fig. 7. — Début de la formation d'un rameau en forme de V. (Grossissement 550 diamètres.)

Peridiniales

by **Johs. Schmidt.**

The following list of marine *Peridiniales* is due to the examination of a number of plankton samples collected by the Danish Expedition in the inner part of the Gulf of Siam. The samples which are 10 in number, were obtained from the surface of the Sea by means of fine silk-nets and were preserved in formaline (4 %)[1]).

This is a list of the samples collected:

Nr. 1.	$^{25}/_{12}$ 1899.	Strait between Lem Ngob and Koh Chang.
„ 2.	$^{9}/_{1}$ 1900.	Between Koh Kahdat and Koh Kut.
„ 3.	$^{11}/_{1}$ 1900.	S. of Koh Chang.
„ 4.	$^{16}/_{1}$ 1900.	W. of Koh Chang, N. of Koh Savan.
„ 5.	$^{17}/_{1}$ 1900.	W. of Koh Chang, S. of Koh Savan.
„ 6.	$^{18}/_{1}$ 1900.	S. of Koh Chang.
„ 7.	$^{27}/_{1}$ 1900.	North End of Koh Kut.
„ 8.	$^{28}/_{1}$ 1900.	7 miles S. of Koh Kut.
„ 9.	$^{31}/_{1}$ 1900.	18 miles W. of Koh Chang[2]).
„ 10.	$^{21}/_{3}$ 1900.	1—2 miles S. of Koh Kram.

In the following list of species recorded

c means *predominant*
\+ „ *common*
r „ *rare*
rr „ *very rare* (only a few specimens seen).

[1]) The *Diatoms* contained in the Plankton-samples will be published later on.
[2]) This sample seems to consist exclusively of *Trichodesmium Hildebrandtii* Gomont.

Prorocentraceae.

Exuviella Cienk.

1. **E. compressa** (Bail.) Ostenfeld, Iagttagelser over Overfladevandets Temperatur, Saltholdighed og Plankton paa islandske og grønlandske Skibsrouter, 1899, p. 59; *Dinopyxis compressa* Stein, Der Organismus der Infusionsthiere III. Abtheil., Leipzig 1878—83, Pl. I, f. 34—38.

6 (rr).
Area: Almost ubiquitous.

Prorocentrum Ehrenbg.

2. **P. micans** Ehrenbg.

1 (rr) — 2 (rr) — 3 (rr) — 6 (rr) — 8 (rr).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

Peridiniaceae.

Pyrophacus Stein.

3. **P. horologium** Stein l. c., Pl. XXIV, f. 1—13.

1 (rr) — 2 (rr) — 7 (rr) — 10 (rr).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

Ceratium Schranck.

4. **C. tripos** (O. F. Müller) Nitsch.

var. **baltica** Schütt, Pflanzenleben d. Hochsee, p. 266, f. 4 a.

I observed two slightly different forms both of which may be referred to the above variety by Schütt. The first form differs from Baltic specimens by the left posterior horn being somewhat bent forward. The second form observed is characterized by the posterior horns being longer and running more parallel. I name this form:

f. **parallela** Schm. n. f. (see fig. 1).

It closely approaches to the forms figured by Cleve in Report on the Phyto-Plankton collected on the expedition of H. M. S. „Research", 1896, Fifteenth Annual Report of the Fishery Board for Scotland, Part III, Pl. 1, fig. 1, 1897.

1 (rr) — 2 (rr) — 3 (rr) — 4 (rr) — 6 (rr) 8 (rr).
Area: Atlantic.

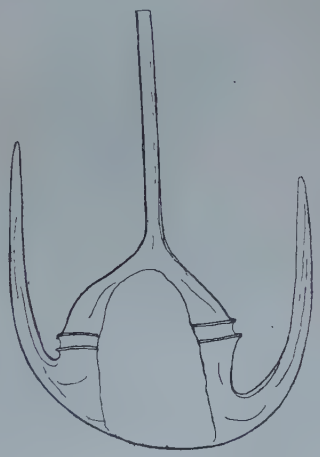


Fig. 1. *Ceratium tripos*, var. *baltica* Schütt, f. *parallela*. Ventral view.

var. **brevis** Ostenfeld & Schmidt, Plankton fra det Røde Hav og Adenbugten, Vidensk. Meddel. Naturh. Foren. Kjøbenhavn, 1901, p. 164, f. 13.

10 (rr).
Area: Red Sea, Indian Ocean.

var. **dispar** Pouchet, Contributions à l'histoire des Péridiniens marins, Journ. de l'anat. et de la physiol. 1883, p. 423, fig. D; non Pouchet in Voyage de „La Manche" à l'île Jan Mayen et au Spitzberg (Juillet—Août 1891), p. 171, fig. 13 B, Paris 1894 = *C. curvicorne* (Daday) Cleve.

A few specimens not differing from Pouchet's figure were met with in two collections.

2 (rr) — 6 (rr).
Area: Mediterranean.

var. **gracilis** Schröder, Phytoplankton des Golfes von Neapel, Mitth. a. d. Zool. Stat. zu Neapel, Bd. 14, 1900, Pl. 1, f. 17 b, e; Ostenfeld & Schmidt l. c. p. 164, f. 14; non Gourret, Péridiniens du golfe de Marseille, Annal. du Musée d'hist. nat. de Marseille, zool., vol. I, n° 8, 1883, Pl. 1, f. 1.

2 (rr) — 3 (rr) — 4 (+) — 5 (rr) — 6 (r) — 10 (rr).
Area: Mediterranean, Red Sea, Indian Ocean.

5. **C. dens** Ostenfeld & Schmidt, l. c., p. 165, f. 16.

In the main species the left posterior horn is straight or somewhat curved (l. c. fig. 16). In one collection I found a variety of *C. dens* viz.

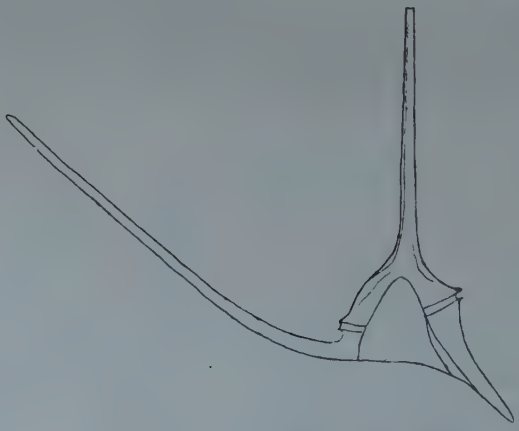


Fig. 2. *Ceratium dens* Ostenfeld & Schmidt, var. *reflexa*. Ventral view.

var. **reflexa** Schm. n. var. (Fig. 2), which is characterized by the direction of the left posterior horn.

In the Gulf of Siam this characteristic species often occurs in short chains (4 specimens together).

1 (rr) — 2 (+) — 3 (+) — 4 (+) — 5 (r) — 7 (+).
and var. *reflexa* 4 (rr).

Area: Red Sea, Indian Ocean.

6. **C. curvicorne** (Daday) Cleve, Notes on some Atlantic Plankton-Organisms, Kgl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 14; *C. tripos* var. *curvicorne* Daday, Termezetrajzi füzetek, 1887—88, Pl. III, figg. 4, 8, 12, 14; figurae nostrae 3 et 4.

Fig. 3.
Ceratium curvicorne (Daday) Cleve.
Ventral view.

Fig. 4.
Ceratium curvicorne (Daday) Cleve
Lateral view.

This species seems to be abundant in the Gulf of Siam. The specimens observed agree well with Dadays figures; but sometimes the curvature of the right posterior horns is less pronounced. As shown in fig. 4 the ventral face of the body is concave and the basilar parts of the posterior horns proceed in a nearly right angle to the transversal axis.

2 (r) — 3 (+) — 4 (+) — 5 (rr) — 6 (+) — 7 (+) — 8 (rr) — 10 (rr).
Area: Warmer Atlantic, Mediterranean, Red Sea, Indian Ocean.

7. **C. contortum** (Gourret) Cleve, Notes on some Atlantic Plankton-Organisms, Kgl. Sv. Vet.-Ak. Handl. Bd. 34, No. 1, p. 14, Pl. VII, f. 12, 1900; *C. gibberum* var. *contortum* Gourret l. c. Pl. II, f. 33; Schütt, Pflanzenleben d. Hochsee, p. 268, fig. 78 VII b.

2 (rr) — 4 (r).
Area: Warmer Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

8. **C. tenue** Ostenfeld & Schmidt l. c. p. 166, fig. 18.

2 (rr).
Area: Red Sea, Indian Ocean.

9. **C. macroceras** Ehrenberg?; *C. tripos β macroceras* Claparède & Lachmann, Études sur les Infusoires et les Rhizopodes, vol. I, Pl. 19, f. 1, Mém. de l'Inst. Génévois, t. V—VI, 1858—59.

This species varies much in regard to length, direction and spinosity of the posterior horns. I saw forms agreing with Bergh's figure (Organismus d. Cilioflagellaten, Morphol. Jahrb. Bd. 7, 2, Taf. XIV, fig. 27), further a form with longer and more straight posterior horns (cfr. the quoted figure by Claparède & Lachmann) and also the form figured by Ostenfeld & Schmidt l. c. fig. 19, where the posterior horns are short and ventrally bent. In the Gulf of Siam *C. macroceras* sometimes occurs in short chains (2 specimens together).

2 (r) — 3 (r) — 4 (rr) — 5 (rr) — 7 (r) — 10 (r).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

10. **C. volans** Cleve, Notes on some Atlantic Plankton-Organisms, Kongl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 15, Pl. VII, Fig. 4, 1900; Ostenfeld & Schmidt, Plankton fra det Røde Hav og Adenbugten, Vidensk. Meddel. Naturh. Foren. Kjobenhavn, 1901, p. 168, f. 21.

2 (rr).
Area: Warm Atlantic, Red Sea, Indian Ocean.

11. **C. flagelliferum** Cleve, Notes on some Atlantic Plankton-Organisms, Kongl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 14, Pl. VII, Fig. 12, 1900.

The horns are often much longer than figured by Cleve.

1 (rr) 2 (+) 3 (+) 4 (r) 5 (rr) 6 (rr) 7 (r) 10 (r).
Area: Tropical Atlantic, Red Sea, Indian Ocean.

12. **C. furca** (Ehrbg.) Dujardin, Hist. nat. d. Zoophytes, Infusoires, Paris 1841.

This species occurs in large quantity in our area.

1 (rr) — 2 (+) — 3 (+) — 4 (r) — 5 (r) — 6 (c) — 7 (+) — 8 (rr) — 10 (r).
Area: Ubiquitous.

13. **C. lineatum** (Ehbg.) Cleve, Plankton collected by the Swedish Expedition to Spitzbergen in 1898, Kgl. Sv. Vet.-Ak. Handl. Bd. 32, No. 3, 1899, p. 36; *Peridinium lineatum* Ehrenbg.

Sparingly with the preceding species.
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Bering Sea.

var. **longiseta** Ostenfeld & Schmidt, Plankton fra det Røde Hav og Adenbugten, Vidensk. Meddel. Naturhist. For. Kjøbenhavn, 1901, p. 163, fig. 12.

This variety sometimes occurs in short chains (2 specimens together); then only the free specimen has a long superior horn.

2 (rr) — 3 (rr) — 4 (+) — 5 (rr) — 6 (r).
Area: Red Sea, Indian Ocean.

var. **robusta** Cleve, Plankton from the Southern Atlantic and the Southern Indian Ocean, Öfv. af Kongl. Sv. Vet.-Ak. Förh. Nr. 8, p. 925, fig. 6, 1900.

4 (rr).
Area: Southern Indian Ocean.

14. **C. candelabrum** Ehbg.; Stein, l. c. Pl. XVI, f. 15, 16.

2 (rr) — 4 (rr) — 7 (rr).
Area: Warm Atlantic, Mediterranean, Red Sea, Indian Ocean.

15. **C. fusus** (Ehbg.) Dujardin l. c.

1 (rr) — 2 (r) — 3 (r) — 6 (r) — 7 (r) — 10 (r).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

var. **extensum** Gourret, Annal. du Musée d'hist. nat. de Marseille, zool., vol. I, n° 8, p. 52, Pl. 4, f. 56.

2 (rr) — 3 (rr).
Area: Warm Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

Gonyaulax Diesing.

16. **G. polygramma** Stein, l. c. Pl. IV, f. 15.

2 (rr) — 4 (+) — 5 (r) — 6 (+) — 7 (r).
Area: General in warm and temperate Seas.

17. **G. spinifera** (Clap. & Lachm.) Stein, l. c. Pl. IV, f. 10—12.

2 (rr) — 3 (r) — 6 (+).
Area: Atlantic, Mediterranean.

18. **G. hyalina** Ostf. & Schm., l. c. p. 172, f. 24.

4 (r) — 5 (r) — 6 (r).
Area: Indian Ocean.

Goniodoma Stein.

19. **G. acuminatum** Stein, Pl. VII, f. 1—16.

2 (rr) — 3 (rr) — 4 (rr) — 5 (rr) — 6 (r) — 7 (r) — 10 (rr).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

20. **G. armatum** (Schütt); *G. acuminatum* var. *armata* Schütt, Die Peridinieen Pl. IX, fig. 32; *G. fimbriatum* Murray & Whitting, Transactions of the Linnean Society of London, 2nd Ser., Botany, Vol. V, Part 9, 1899, p. 325, Pl. XXVII, fig. 1 a, b.

2 (rr) — 4 (rr) — 10 (rr).

Area: Atlantic, Red Sea, Indian Ocean, Pacific.

Diplopsalis Bergh.

21. **D. lenticula** Bergh, l. c. Pl. XVI, fig. 60—62.

1 (+) — 2 (rr) — 3 (rr) — 10 (+).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

22. **D. saecularis** Murray & Whitting l. c. p. 325, Pl. XXVIII, fig. 5 a, b.

10 (rr).

Area: Atlantic from a little south of the Azores to the Isthmus of Panama. Red Sea, Indian Ocean.

Ostreopsis Schm. nov. gen.

Body flattened, oyster-shaped. Apex excentric, marked by a narrow, slit-shaped area. Longitudinal girdle small, not proceeding to apex, only to be seen on the inferior valve. 3 apical plates (one of which being reduced) and 1 antapical plate are present. Structure of plates porous.

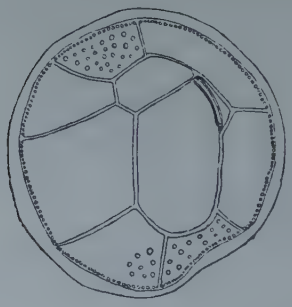


Fig. 5. *Ostreopsis siamensis* Schmidt. Arrangement of plates in the superior valve.

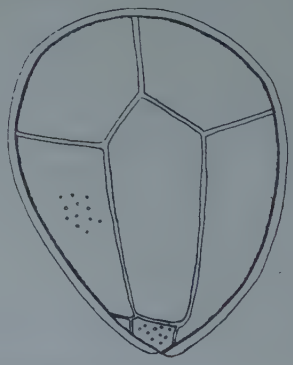


Fig. 6. *Ostreopsis siamensis* Schmidt. Another specimen. Arrangement of plates in the inferior valve.

Fig. 7. *Ostreopsis siamensis* Schmidt. Sketch of a specimen in lateral view. Arrangement of plates not indicated.

In its shape this peculiar genus is nearest to *Pyrophacus* Stein of the genera hitherto known; the number of apical- and antapical plates reminds of *Gonyaulax* Diesing, but from both those genera it is easily distinguished by the above features.

23. **O. siamensis** Schm. n. sp., figg. 5, 6, 7.

Body flat, oyster-shaped, somewhat convexo-concave, in a transversal section view triangular or roundish. Superior valve convexe, with 3 apical plates (one of which being very small) and 7 præmedian plates; inferior valve a little concave, with 1 antapical and 4 larger postmedian plates (and sometimes with small accessory plates). Longitudinal girdle short, only on the inferior valve. Structure coarsely porous, like that of *Ceratium tripos*. Length of sagittal axis about 90 μ.

2 (r) — 3 (rr) — 6 (rr).

Peridinium Ehrenberg.

24. **P. divergens** Ehrenberg.

This species, which appears in large quantity in the Gulf of Siam, varies exceedingly much in regard to size, shape and length of the posterior horns.

1 (+) — 2 (r) — 3 (+) — 4 (rr) — 5 (r) — 6 (+) — 7 (+) — 10 (+).
Area; Ubiquitous.

25. **P. conicum** (Gran) Ostenfeld & Schmidt l. c., p. 174; *P. divergens* var. *conica* Gran, Hydrographic-Biologic Studies of the North-Atlantic Ocean and the Coast of Nordland, 1900, p. 47; Fig. Bergh l. c., Pl. XV, f. 43—44; Pouchet l. c., Contributions I, fig. 31—33; Schütt l. c. Pl. XIII, f. 43$_{13, 14}$.

1 (rr) — 6 (r) — 7 (rr) — 10 (r).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

26. **P. oceanicum** Vanhöffen, in Drygalski, Grönland-Expedition der Gesellsch. für Erdkunde zu Berlin, vol. II, 2 part, Pl. V, fig. 2.

2 (rr) — 6 (rr) — 7 (rr) — 10 (rr).
Area: Atlantic, Red Sea, Indian Ocean.

27. **P. elegans** Cleve, Notes on some Atlantic Plankton-Organisms, Kgl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 16, Pl. VII, fig. 15—16.

3 (rr) — 6 (rr).
Area: Warm Atlantic, Red Sea, Indian Ocean.

28. **P. Steinii** Jørgensen, Protophyten u. Protozoën im Plankton aus der norweg. Westküste, Bergens Museums Aarbog, 1899, No. VI, p. 38; *P. Michaelis* Stein l. c., Pl. IX, f. 9—14 (non Ehrenberg).

2 (rr) — 3 (rr) — 4 (rr) — 6 (r).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

29. **P. tristylum** Stein var. **ovata** Schröder l. c., p. 18, Taf. 1, fig. 13.

2 (rr) — 3 (rr) — 6 (rr).
Area: Mediterranean, Red Sea, Indian Ocean.

30. **P. pellucidum** (Bergh) Schütt, Die Peridineen p. 157, Pl. XIV, f. 45.

1 (rr) — 2 (rr) — 6 (rr).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

31. **P. globulus** Stein, l. c. Pl. IX, f. 5—8.

5 (rr) — 10 (rr).
Area: Atlantic, Red Sea, Indián Ocean.

32. **P. pedunculatum** Schütt, Die Peridineen, Pl. XIV, f. 47.

1 (rr) — 4 (rr) — 6 (rr) — 10 (rr).
Area: Atlantic, Red Sea, Indian Ocean.

Podolampas Stein.

33. **P. bipes** Stein l. c., Pl. VIII, fig. 6—8.

2 (rr) — 3 (rr) — 4 (rr) — 5 (rr) — 6 (rr) — 7 (rr).
Area: Tropical and subtropical Seas.

Blepharocysta Ehrenberg.

34. **B. splendor maris** Ehrenberg; Stein, l. c. Pl. III. f. 17—19, Pl. VIII, f. 3—5.

2 (rr) — 3 (rr) — 4 (rr) — 5 (+) — 6 (r) — 10 (r).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

Phalacroma Stein.

35. **P. doryphorum** Stein, l. c. Pl. XIX, f. 1—4.

2 (rr).
Area: General in warm Seas.

36. **P. vastum** Schütt, Die Peridineen, Pl. III, fig. 16.

6 (rr) — 7 (rr).
Area: Warm Atlantic.

37. **P. Rudgei** Murray & Whitting l. c , p. 331, Pl. XXXI, fig. 6 a, b.

In one single sample I found a small species of *Phalacroma*, which agrees with the quoted figure by Murray & Whitting.

2 (rr).
Area: Atlantic (37° 55′ N., 36° 42′ W.).

Dinophysis Ehrenberg.

38. **D. homunculus** Stein, l. c. Pl. XXI, f. 2, 5.

Together with the type there occurs in the Gulf of Siam a form viz. f. **pedunculata** Schm. n. f., which is characterized by the long and plainly set off posterior protuberance.

3 (r) — 4 (r) — 6 (+) — 7 (rr).
Area: General in warmer Seas.

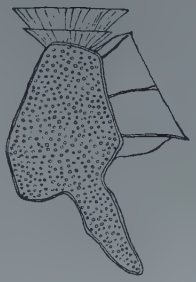


Fig. 8. *Dinophysis homunculus* Stein, f. *pedunculata*. Lateral view.

39. **D. miles** Cleve, Plankton from the Red Sea, Öfv. af Kongl. Sv. Vet.-Ak. Förh. 1900, No. 9, p. 1030, Fig. 1; *D. aggregata* Weber van Bosse, Annal. du Jardin Bot. de Buitenzorg, 2e sér., vol. II, p. 140, Pl. XVII, f. 3—4; *Heteroceras Schröteri* Achille Forti, Ber. d. deutsch. Botan. Ges. 1901, p. 6, f. I—II.

var. **indica** Ostf. & Schm. l. c. p. 170.

2 (rr) — 4 (rr).
Area: Indian Ocean.

40. **D. sphaerica** Stein l. c. Pl. XX, f. 3—4.

5 (rr) — 10 (rr).
Area: Atlantic, Red Sea, Indian Ocean.

41. **D. rotundata** Clap. & Lachm., l. c. p. 409, Pl. XX, f. 16; Jørgensen, l. c. p. 31.

5 (rr).
Area: Atlantic.

Amphisolenia Stein.

42. **A. bidentata** Schröder, l. c. p. 20, Pl. I, f. 16 a—c.

2 (rr) — 3 (rr) — 4 (rr) — 5 (rr) — 7 (rr).
Area: Mediterranean, Red Sea, Indian Ocean.

Ornithocercus Stein.

43. **O. magnificus** Stein. l. c. Pl. XXIII, f. 1; Schütt, Centrifugal. Dickenwachsthum der Membran, Bot. Ztg. 1900, p. 18 (Sep.), f. 8—10.

2 (rr).
Area: Warm Atlantic, Mediterranean, Red Sea, Indian Ocean.

Murracytae.

Pyrocystis Murray.

44. **P. lunula** Schütt.

2 (rr).
Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

Om Papildannelsen hos *Aira caespitosa*.

Af

C. Raunkiær.

Ved Papiller forstaas her de korte, butte Udposninger, som findes paa mange Planters Hudceller. Disse Papiller hører vel formelt til Haardannelserne, men de danner en selvstændig Gruppe og kan ikke betragtes som Begyndelsen til en sædvanlig Haarbeklædning. Medens de almindelige Haar i Regelen udgaar fra Celler, der er meget mindre og ofte ogsaa af en simplere Form end de øvrige Hudceller, saa udgaar Papillerne netop altid fra de almindelige Hudceller; heraf følger atter, at medens de almindelige Haars Basis i Regelen har omtrent et lige saa stort Omfang som den Hudcelle, hvorfra Haaret udgaar, saa har Papillerne derimod som oftest et meget mindre Omfang end den Hudcelle, hvorpaa de sidder; og da Papillen saaledes kun indtager en ringe Del af Cellens Overflade, kan der paa samme Celle sidde flere Papiller, hvilket heller ikke saa sjeldent finder Sted, f. Ex. paa Bladene hos visse *Marsilia*-Arter og mange Græsser (især Arter af *Oryzeae*, *Bambuseae*, *Andropogoneae* og *Zoysieae*); hvor man har at gøre med almindelige Haar, findes der, saa vidt mig bekendt, ingensinde flere Haar paa samme Hudcelle.

I mange Tilfælde er Papillen ganske vist omtrent af samme Omfang som den Hudcelle, hvorpaa den sidder, saaledes ofte paa Blosterblade, endvidere paa Løvbladene hos visse Arter af *Euphorbia*, *Anthurium*, *Solenosterigma*, *Haemaria*, *Heliconia* o. fl. a.; men dette staar ikke i Forbindelse med en Forskel i Størrelse mellem papilbærende og ikke papilbærende Celler, saaledes som Tilfældet er hos de almindelige Haar, men er en Følge af, at samtlige Hudceller i det Hele taget er smaa.

Medens de andre Former af Haar i Regelen let iagttages med det uvæbnede Øje eller i det mindste ved Loupens Hjælp, er

Papillerne som oftest saa smaa, at Mikroskopet maa tages til Hjælp for at iagttage dem; thi selv om man af det ejendommelige matte Skær, som en papilbærende Plantedel har, til en vis Grad kan slutte sig til Papillernes Tilstedeværelse, er en mikroskopisk Undersøgelse dog i Regelen nødvendig for med Sikkerhed at afgøre Sagen. Det er derfor ikke overraskende, at Papiller findes hos langt flere Planter end de, hos hvilke de hidtil er omtalt i Litteraturen.

Med Hensyn til Papillernes Forekomst, da findes de jo paa mange forskellige Organer, men dog især paa Ar, farvede Blosterblade og paa Løvblade. Arpapillernes Forekomst og Betydning er vel kendt. Hvad Papillerne paa Blosterblade angaar, da veed vi idetmindste, at de er meget udbredte, og at det matte, fløjelsagtige Udseende, som saa mange farvede Blosterblade har, skyldes Tilstedeværelsen af Papiller; derimod er det usikkert, hvilken Betydning disse Papiller har og om de overhovedet har nogen særlig Betydning. At det af Papillerne betingede fløjelsagtige Udseende har Betydning for Bestøvningen ved Insekters Hjælp ved at forhøje Blosterbladenes Egenskab som Lokkeapparat, er kun en Formodning, hvilket ogsaa gælder den Opfattelse, at Papillerne skal tjene til, at Insekterne lettere kan faa Fodfæste. De med Papiller udstyrede Blosterblade vædes ikke eller dog kun vanskelig, hvorfor man ogsaa har set Papillernes særlige Betydning deri, at de skal tjene som Værn mod Væde; denne Forklaring holder dog næppe heller Stik, idet der er den største Sandsynlighed for, at Grunden til, at den papilbærende Flade skyder Vandet, ikke ligger i Papillernes Tilstedeværelse, men i den særegne Beskaffenhed af Hudcellernes Overflade.

Løvbladpapillernes Former, Forekomst og formodede Betydning skal jeg ikke her nærmere komme ind paa, da jeg andetsteds har behandlet disse Spørgsmaal (Raunkiær, 1, 505—513, 644—654), hvortil der her kan henvises; det vil deraf kunne ses, at Løvbladpapillernes økologiske Betydning langt fra er fuldstændig opklaret; naar hertil kommer, at vi intet ved hverken om Papillernes Historie (Fylogenese) eller om Betingelserne for deres individuelle Udvikling (Ontogenese), er det klart, at vi i det hele taget er meget langt fra at have nogen Forstaaelse af disse Dannelser.

Ved mine tidligere Undersøgelser over Løvbladpapillerne har jeg, hvor Lejlighed gaves, haft Opmærksomheden henvendt paa, om der ikke skulde vise sig Tilfælde, i hvilke Papillernes Tilstedeværelse var betinget af bestemte ydre Faktorer; men Papillerne syntes at

være en meget fast Karakter, der under selv de forskelligste ydre Forhold var tilstede; hos *Glyceria fluitans* f. Eks. fandtes Papillerne baade paa Luftbladene og paa de under Vandet udviklede Blade og er allerede tilstede længe før Bladet udfoldes. Ganske vist fandt jeg Tilfælde, navnlig hos visse Arter af Slægten *Carex*, i hvilke der hos samme Art var stor Forskellighed med Hensyn til Papillernes Uddannelse, idet nogle Individer havde stærkt fremtrædende Papiller, medens de hos andre var faa og svage eller manglede ganske; men Materialet satte mig ikke i Stand til at afgøre, hvorvidt disse Forskelligheder skyldtes forskellige Kaar eller beroede paa, at jeg havde med forskellige faste Varieteter at gøre.

Men selv om denne Karakter i mange Tilfælde er „fast", ɔ: ikke betinget af specielle ydre Forhold, er det jo langt fra givet, at den hos alle Arter er fast, og jeg fortsatte derfor min Søgen efter Arter, hos hvilke Papillerne maatte vise sig at være specielt betingede af bestemte ydre Forhold. At faa dette konstateret, forekommer mig nemlig at være af stor Vigtighed for Forstaaelsen af disse Dannelser i det hele taget. Det synes mig nemlig paa Forhaand mest sandsynligt, at Papillerne ikke er opstaaede som en af de ydre Faktorer fra Begyndelsen af uafhængig Karakter, men at de oprindelig har været betingede af visse ydre Kaar, og at de saa, idet Planten stadig voksede under disse Kaar, er bleven fæstnede saaledes, at de tilsidst ogsaa udvikles, selv om de ydre Forhold, der oprindelig betingede deres Ontogenese, ikke længere er tilstede.

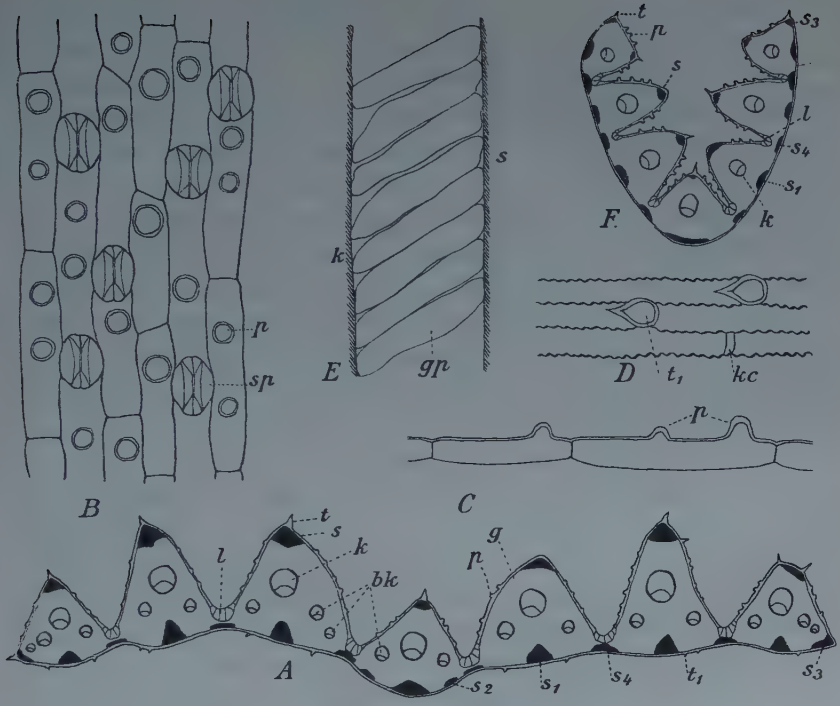
I Vinteren 1900 undersøgte jeg med et andet Formaal for Øje Bladets Bygning hos Individer af *Aira caespitosa*, der voksede paa en solaaben Skoveng i Jonstrup Vang; jeg saa da, at der fandtes Papiller paa disse Individers Blade, hvilket overraskede mig meget, da jeg ikke tidligere havde set Papiller hos *Aira caespitosa*, skønt jeg til Brug for Fremstillingen i mit Arbejde: „De danske Blomsterplanters Naturhistorie" ogsaa havde foretaget en mikroskopisk Undersøgelse af Bladbygningen hos denne Art. Hvad enten jeg nu tidligere har overset Papillerne eller jeg til Undersøgelse har haft et Individ, der manglede Papiller, saa blev det mig nu ved Undersøgelse af Planter fra forskellige Lokaliteter snart klart, at i Overensstemmelse med de ydre Betingelsers Forskellighed er Papillerne hos denne Art snart tilstede, snart mangler de ganske eller er færre og svagere end ellers. Vi har saaledes her en Plante, hvor det bliver muligt at studere Betingelserne for Papillernes Ontogenese.

Aira caespitosa.

Denne Arts egentlige Vokseplads er, i det mindste hos os, solaaben Bund i Moser og paa Enge; den kan dog ogsaa vokse i Skygge i Skove, hvor den imidlertid øjensynlig befinder sig under Forhold, der, hvis Skyggen er stærk, er ugunstige for dens Trivlsel, saa at den efterhaanden sygner hen og tilsidst dør; dog kan den holde sig i en lang Aarrække, og hvor Skyggen ikke er for stærk, kan den endog blomstre og sætte Frugt. Bortset fra en Række andre Forhold, udmærker Skyggeplanterne sig ved visse, af det svage Lys betingede Forandringer i Bladbygning, navnlig Hudens Bygning, som senere skal omtales. Først vil det være nødvendigt at se lidt nærmere paa den almindelige Forms — Solformens — Bladbygning. Dennes Hovedtræk er vel kendt og skildret af flere, saaledes af Kareltschikoff (1), Duval-Jouve (1, 2), Samsøe Lund (1) og Raunkiær (1, 589, 526, 529); men for Sammenligningens Skyld maa jeg dog her give en mere i det enkelte gaaende Skildring, navnlig for visse Punkters Vedkommende; denne Skildring gælder den midterste Del af Løvbladskuddenes Blade.

Solformens Bladbygning. Ved dybe Længdefurer paa Bladoversiden er Grønvævet delt i flere i Regelen tresidet-prismeformede Partier, Ribber, der kun ved et tyndt Parti paa Bladundersiden staar i Forbindelse med hverandre (Fig. *A*). Ribbernes Antal var i de allerfleste Tilfælde 7, men der kan findes fra 5 til 11; paa Tværsnittet er de kegleformede, og omtrent midtvejs mellem Overkanten og Undersiden ligger der i hver Ribbe en større Karstreng (Fig. *A*, *k*); nærmere mod Undersiden findes desuden i hver Ribbe 1—2 mindre Karstrenge, som jeg for Kortheds Skyld vil kalde Bi-Karstrenge (Fig. *A*, *bk*); deres Stilling ses i Fig. *A*; deres Antal er ret variabelt og retter sig tildels efter Bladets Mægtighed; i nogle Tilfælde findes 3 Bi-Karstrenge i enkelte Ribber, i andre Tilfælde slet ingen; Bladets Tal af disse Strenge er i Reglen 7—15, men kan synke ned til 5 og stige i det mindste til 18.

I hver Bladrand og i hver Ribbes øverste Kant ligger der umiddelbart under Huden en Styrkevævstreng (Fig. *A*, s_3 og s); paa Undersiden ligger der paa samme Maade en Styrkevævstreng ud for hver af Hovedkarstrengene (Fig. *A*, s_1); af og til findes der desuden en ganske lille Styrkevævstreng ud for enkelte af de største Bi-Karstrenge (Fig. *A*, s_2). Foruden disse Strenge, der svarer til dem, der sædvanlig findes i Græssernes Blade, har *A. caespitosa*



A—E, Aira caespitosa. *A*, Bladtværsnit (30 : 1), *g*, Grønvæv; s, s_1, s_2, s_3, s_4, Styrkevæv; *k*, *bk*, Karstrenge; *t*, t_1, Smaatorne. ɔ: tornformede Haar; *p*, Papiller; *l*, Ledceller. *B*, Huden ud for Grønvævet paa Bladoversiden, set ovenfra (215 : 1); *sp*, Spalteaabninger; *p*, Papiller. *C*, Længdesnit gennem Hudceller fra *B* (215 : 1); *p*, Papiller. *D*, Huden ud for Grønvævet paa Bladundersiden (215 : 1): t_1, Smaatorne; *kc*, Kortcelle. *E*, Skraatstillede Grønpalissader, *gp*, mellem en Styrkevævstreng, *s*, og en Karstreng, *k*. (Skraastilling af Grønpalissaderne er almindelig udbredt hos Græsserne.) *F*, *Aira alpina*. Bladtværsnit (30 : 1); Bogstaverne har samme Betydning som i *A*.

endnu et System af Styrkevævstrenge, der staar i nøje Forbindelse med Bladets øvrige ejendommelige Bygning, idet de er anbragte saaledes, at de styrker de ganske tynde Partier mellem Ribberne: de er 1—faa Cellelag tykke, baandformede Strenge, der ligger mellem Undersidens Overhud og Overhuden i Bunden af Bladoversidens Furer (Fig. *A*, s_4), dog ofte adskilte fra Ledcellerne ved et Lag smaa Saftceller.

Hvad Overhuden angaar, da er den paa Bladoversiden uddannet paa tre forskellige Maader, paa Undersiden derimod kun paa to. Tager vi først Oversiden, da har vi ud for Styrkevævstrengene i Ribbernes øverste Kant en Hud, der dels bestaar af

forholdsvis lange og smalle Celler, „Langceller“, og af ganske korte Celler, „Kortceller“; paa disse Hudstriber og paa de tilsvarende, der ligger ud for Styrkevævstrengene i Bladrandene, findes en stor Mængde kraftige Smaatorne (Fig. *A*, *t*), der udgaar fra Kortcellerne; de er rettede stærkt opad mod Bladets Spids og bevirker, at Bladene paa Overfladen og i Randen er skærende skarpt rue.

Paa Ribbernes Sider, ud for Grønvævet, er Hudcellerne betydelig bredere end ud for Styrkevævet; her findes den langt overvejende Del af Bladets Spalteaabninger (Fig. *B*, *sp*); der findes nemlig kun ganske faa Spalteaabninger paa Bladundersiden; bortset fra Spalteaabningerne er de allerfleste Celler Langceller; af Kortceller findes kun ganske enkelte, idet Spalteaabningerne indtager Kortcellernes Plads. Hver Langcelle er her udstyret med 1—2 lave Papiller (*p* i Fig. *A*, *B* og *C*).

Den tredie Maade, paa hvilken Oversidens Hud er uddannet, træffes i Bunden af Furerne, hvor Hudcellerne er uddannede som Ledceller (Fig. *A*, *l*), hvis Udseende er det for Græsserne almindelige.

Paa Bladundersiden er Huden ud for Styrkevævstrengene uddannet paa samme Maade som den tilsvarende Del af Oversidens Hud, kun findes der ingen Smaatorne ud for Undersidens Styrkevæv.

Paa de smalle Striber, hvor Grønvævet mellem Styrkevævstrengene grænser op til Undersidens Hud, findes nogle faa Spalteaabninger, i Reglen i to Rækker; i øvrigt bestaar Huden af Langceller og Kortceller (Fig. *D*, *kc*), flest af de første, tildels fordi de tilstedeværende Spalteaabninger indtager Kortcellernes sædvanlige Plads. Papiller findes ikke, men en stor Del af Kortcellerne er udstyret hver med en ganske lille Torn (Fig. *D*, t_1).

Skyggeformens Bladbygning. Bladene er hos Skyggeformen lange, slappe og forholdsvis smalle, men har dog i Regelen det samme Antal Ribber som Solformens Blade, nemlig i Almindelighed 7. Jeg skal i øvrigt ikke her komme ind paa de sædvanlige anatomiske Forskelligheder mellem Sol- og Skyggebladene, men kun fremhæve det, som har særlig Interesse for det foreliggende Spørgsmaal, nemlig det Forhold, at Huden ud for Grønvævet paa Bladoversiden enten ganske mangler Papiller eller disse er faa og svage; en anden Mærkelighed hos Skyggebladene viste sig deri, at samtidig med at Papillerne var forsvundne fra de nævnte Hudstriber, optraadte der paa samme Sted langt flere Smaatorne end hos Solbladene; kun hos en af de mange undersøgte Skyggeplanter var dette ikke Tilfældet, idet jeg her slet ingen Smaatorne saa; jeg

vil tilføje, at dette Individ var et af de ved de ugunstige Forhold mest medtagne.

Saa vel af Skyggeplanter som af Solplanter har jeg undersøgt en stor Mængde Individer og allevegne fandtes den ovenfor nævnte Forskel i Papiludstyr; den Formodning laa derfor nær, at Papillernes Tilstedeværelse hos de enkelte Individer var betinget af en vis Lysmængde eller Forhold, der ledsager Lyset; jeg undersøgte derfor paa forskellige Steder, hvorledes *Aira caespitosa*-Bevoksningerne forholdt sig paa Overgangen mellem de forholdsvis stærkt belyste Skovenge og Skovens Skygge; det viste sig da, at efterhaanden som man fra Skovengen kom ind i Træernes Skygge, forsvandt Papillerne mere og mere fra *Aira caespitosa*'s Blade. Allerede under den yderste Rand af et mod Nord, Øst eller Vest vendende Skovbryns Kroner, hvor *A. caespitosa* endnu stod i kraftige, blomstrende Individer, fandtes en kendelig Formindskelse i Papildannelsen; et Par Meter længere inde i Skoven fandtes endnu ret kraftige Individer uden eller næsten uden Papiller paa Bladene.

Ved disse Iagttagelser blev det vel sandsynligt, men dog ikke absolut sikkert, at Papillerne hos *A. caespitosa* var en plastisk, af bestemte, specielle Forhold betinget Karakter; den Mulighed var ikke udelukket, at Manglen eller Tilstedeværelsen af Papiller hos de undersøgte Individer hidrørte fra, at jeg havde at gøre med forskellige systematiske Enheder med forskelligt, men for de enkelte Former uforanderligt Papiludstyr. For at faa dette Spørgsmaal afgjort med Sikkerhed, anstillede jeg følgende Forsøg. Fra en solaaben Skoveng tog jeg en med Papiller udstyret Plante, *A*, og anbragte samme i Skygge; samtidig tog jeg en Plante, *B*, som voksede i Skygge i Skoven og som ganske manglede Papiller, og plantede den i fuldt Sollys. Efter c. 3 Maaneders Forløb undersøgte jeg de sidst udviklede Blade hos disse to Planter og fandt, at der hos *A* ikke var Spor af Papiller, medens der hos *B* var mange, om end temmelig svage Papiller. *A* anbragtes nu igen i fuldt Sollys ved Siden af *B*; efter c. 8 Maaneders Forløb undersøgtes atter begge Planter med det Resultat, at de i Mellemtiden udviklede Blade baade hos *A* og *B* var lige saa rigt udstyrede med Papiller som Planter, der hele Tiden havde vokset i Sol. Af dette fremgaar med Sikkerhed, at Papillerne her er en plastisk Karakter. Derimod er det ikke sikkert, at det er Lyset, som betinger Papillerne; det kunde jo ogsaa være de gunstigere Transpirationsbetingelser, idet Luften er mere tør paa de solaabne Lokaliteter end i den skygge-

fulde Skov ved Siden af. For muligvis at faa afgjort, om det er Lyset eller Luftens større Tørhed, der betinger Papillerne, tilsaaede jeg 4 Urtepotter, A, B, C, D, med *A. caespitosa* og anbragte A i et Vindue mod Syd i et Værelse med sædvanlig Stuetemperatur og forholdsvis tør Luft; B anbragtes i samme Lokale, men i et Vindue mod Nord. C og D stilledes i et Væksthus med fugtig Luft, C i Sollys, D helt i Skygge. Luftens Fugtighedsgrad blev vel ikke maalt, men der er sikkert ingen Tvivl om, at Luften i Værelset var langt mere tør end paa den solaabne Skoveng, og i Væksthuset langt fugtigere end i Skovens Skygge, hvor der ingen Papiller udvikledes hos *A. caespitosa*. Frøene spirede straks og efter $3^1/_2$ Maaneds Forløb undersøgtes de sidst udviklede Blade; Resultatet var følgende:

A — i Sollys + tør Luft — Papiller.
B — i Skygge + tør Luft — Papiller.
C — i Sollys + fugtig Luft — Papiller.
D — i Skygge + fugtig Luft — ingen Papiller.

Af Forholdet hos C og D fremgaar nu vel, at Papillerne kan betinges af Lyset eller Forhold, der ledsager Lyset: men den Kendsgerning, at der ikke alene hos A men ogsaa hos B dannedes Papiller, kunde tyde paa, at ogsaa Luftens Tørhed kan betinge Papillernes Dannelse; da jeg imidlertid efter 8 Maaneders Forløb atter undersøgte de sidst udviklede Blade hos A og B, fandtes der, som ventelig var, stadig Papiller hos A, men derimod var B nu fuldstændig uden Papiller. Man kan derfor vistnok med Rette slutte, at Papillerne hos *A. caespitosa* først og fremmest betinges af Lyset eller Forhold, der ledsager Lyset.

Hvorledes nu Lyset virker, er en helt anden Sag, og vi er i dette som i saa mange andre lignende Tilfælde ikke i Stand til at se selv de vigtigste Led af Aarsagskæden fra Lys til Papiller. Disse er allerede til Stede paa Blade, der endnu er indesluttede i de foregaaende Blades Skeder, altsaa før de endnu er blevne udsatte for Lyset; dettes Betydning for Papillernes Dannelse synes saaledes ikke at bero paa en direkte Paavirkning af den enkelte papildannende Celle, men maa ske ad lange Omveje gennem de af Lyset betingede Livsvirksomheder, der er forgaaede i de paa et tidligere Tidspunkt udviklede assimilerende Blade.

Naar det har vist sig, at en Karakter er plastisk, og det er lykkedes at eftervise, hvilke ydre Forhold der betinger dens Tilstedeværelse, saa er derved ikke alene vor Indsigt i den givne Sag bleven

forøget, men vi har tillige faaet et Middel, der sætter os i Stand til muligvis at kaste Lys ogsaa over andre Forhold. Kendskabet til Papillernes Forhold hos *A. caespitosa* kan saaledes blandt andre udnyttes paa to Maader.

Vi kan benytte den Papillerne betingende Faktor som Reagens paa Artens Ensartethed, eller Uensartethed, hvad den givne Karakter angaar; vi kan under samme ydre Betingelser dyrke Individer fra de forskellige Steder af Artens Vokseomraade; viser det sig da, at Individerne ikke forholder sig ens i Papiludstyr, men at f. Eks. Individerne fra et bestemt Omraade ogsaa udvikler Papiller i Skygge, altsaa under Forhold, hvor andre ganske mister dem, saa vil den Ejendommelighed sammenholdt med vedkommende Egns Klima og dettes Historie maaske dog give os nogen Hjælp ved Undersøgelsen over Holdbarheden af den Teori, at en plastisk Karakter kan blive fast derved, at vedkommende Plante gennem talrige Generationer lever under de Forhold, der oprindelig betingede den givne Karakters Ontogenese. Jeg har desværre ikke haft Lejlighed til at foretage saadanne Dyrkningsforsøg med *A. caespitosa*; det er meget vanskeligt for ikke at sige umuligt for en Privatmand at skaffe sig det nødvendige Forsøgsmateriale af levende Planter fra de forskellige Punkter af Artens Voksekreds; men det forekommer mig, at saa vel i dette som i utallige andre lignende Tilfælde maa saadanne Forsøg anstilles, hvis det fylogenetiske Spørgsmaal overhovedet skal behandles rationelt, og jeg kan derfor ikke lade være her at gøre, hvad jeg tidligere har gjort, nemlig at fremhæve, at saadanne Undersøgelser burde optages som et fast Led i botaniske Instituter f. Eks. de botaniske Havers Virkeplan.

Viser det sig, at Artens Individer, hvad den undersøgte Karakter angaar, er ens, ɔ: forholder sig ens under samme Kaar, eller vi ved Forsøgene gaar ud fra en Race, som har vist sig ensartet, saa kan man bruge Papillernes Tilstedeværelse eller Mangel som Reagens paa Klima, hvad dettes Papillerne betingende Faktor angaar, i foreliggende Tilfælde altsaa i første Linie Lysstyrken.

Forskellige Botanikere har jo undersøgt nordiske Planters Bygning og sammenlignet denne med Bygningen af Planter fra sydlige Klimater for at udfinde en mulig Sammenhæng mellem visse Bygningsforhold og Klimaet. Saadanne Undersøgelser alene kan dog ikke føre til sikre Resultater, da Planter, der sammenlignes, enten paa Forhaand vides at være uensartede eller det i hvert Tilfælde ikke vides, om de er ensartede fra Anlægets Side eller ikke; thi

selv om de undersøgte Planter hører til hvad vi kalder „samme Art", behøver de langt fra at være ensartede fra Anlægets Side, og er de ikke det, kan man ikke med nogen Sikkerhed drage Slutning med Hensyn til Sammenhæng mellem Klimaets Forskellighed og de Afvigelser, der findes i indre Bygning hos Planter fra nordlige og sydlige Egne. Hvis man vil opnaa nogenlunde sikre Resultater, maa man gaa ud fra et ensartet Materiale, — et Materiale, som kan sammenlignes, ɔ: Planter med plastiske Karakterer, for hvis Vedkommende vi kender Ontogenesens ydre Betingelser, — og saa se, hvorledes disse Planter forholder sig i de forskellige Klimater. Det vilde saaledes være interessant at se, hvorledes vor *A. caespitosa* vilde forholde sig med Hensyn til Papillerne, naar den dyrkedes i et andet Klima f. Eks. i Grønland eller andre højnordiske Egne. Men ogsaa den Slags Forsøg maa offentlige Institutioner tage sig af, da Vanskelighederne i Reglen vil være uoverkommelige for den enkelte. Jeg har da heller ikke kunnet foretage saadanne Forsøg; derimod har jeg, som et Slags forberedende Arbejde, undersøgt, hvorledes de i de højnordiske Egne samlede Individer af *A. caespitosa* er byggede; af de mange danske Botanikere, som har undersøgt Færøerne, Island og Grønland, er der jo indsamlet et stort Materiale til Undersøgelse. Den højnordiske *A. caespitosa* opføres i Regelen som en egen Form: *A. caespitosa* var. *brevifolia* Hartm.

Aira caespitosa var. brevifolia paa Færøerne. Jeg har haft Lejlighed til at undersøge Planter fra 8 Voksepladser paa Færøerne; i Sammenligning med Individer fra solaabne Lokaliteter hos os var Forholdet følgende; Bladene var mindre, men Ribbernes Antal det samme; der var færre Bi-Karstrenge, 0—8, gennemsnitlig 3 i hvert af de undersøgte Blade; Styrkevævet var gennemgaaende svagere end hos vore Individer; Papillerne paa Overhuden ud for Grønvævet paa Bladoversiden var færre og gennemgaaende svagere, hos ét Individ saa jeg endog slet ingen; i ét Tilfælde fandtes enkelte Smaatorne mellem Papillerne. Ud for Grønvævet paa Bladundersiden fandtes enten ingen eller kun meget faa Spalteaabninger; paa samme Sted var der hos nogle ikke saa faa Smaatorne, hos andre ingen.

Aira caespitosa var. brevifolia paa Island. Fra Island har jeg undersøgt 7 Individer; Ribbernes Antal var som sædvanlig 7; Bi-Karstrengenes Antal var 0—12, gennemsnitlig 4,4 i hvert af de undersøgte Blade. Styrkevævet var svagere end hos danske Individer. Ledcellerne i Bunden af Oversidens Furer naaede ikke altid

helt ned til Bladundersidens Styrkevævstrenge, men kunde være adskilte fra disse ved et Lag Grønceller eller Saftceller. Huden ud for Grønvævet paa Oversiden var udstyret med kun forholdsvis faa og svage Papiller, ja hos et enkelt Individ saas endog slet ingen Papiller; i ét Tilfælde fandtes mellem Papillerne nogle Smaatorne. Huden ud for Grønvævet paa Undersiden havde kun ganske faa Spalteaabninger og blot hos 3 Individer saas her nogle faa Smaatorne.

Af det foregaaende fremgaar tydelig nok, at *A. caespitosa* var. *brevifolia* paa Island og Færøerne har færre og svagere Papiller end *A. caespitosa* paa solaabne Lokaliteter i Danmark; heraf kan man dog endnu ikke med Sikkerhed drage den Slutning, at Planten faar mindre Lys i det første end i det sidste Tilfælde; thi saa længe Dyrkningsforsøg ikke er gjort, er den Mulighed ikke udelukket, at det svage Papiludstyr maaske netop er en Karakter, der udmærker *A. caespitosa* var. *brevifolia*, og at Papiludstyret vilde blive det samme eller maaske endnu svagere, hvis vi bragte Planter fra Island og Færøerne til at vokse hos os. Den Maade, paa hvilken *A. caespitosa* forholder sig i Grønland, tyder dog paa, at Forholdet er dette, at Lysforholdene her er saadanne, der betinger en svagere Papildannelse.

Aira caespitosa i Grønland. Saa vidt jeg ved, er *A. caespitosa* var. *brevifolia* i de senere Aar funden i Grønland, men jeg har ikke haft Lejlighed til at undersøge Individer herfra. Derimod har jeg undersøgt Hovedarten, som er funden forvildet paa et enkelt Sted, nemlig ved Ivigtut. Hartz (1, 17) skriver: „Ved Ivigtut findes der en rig Ukrudtsflora af europæiske Planter, der ere førte ind med Ballast, Havefrø o. lign.“; og blandt de Planter, som Forf. nævner herfra, er ogsaa *A. caespitosa*, hvoraf der hjembragtes et Eksemplar. Det er nu vel ikke givet, men dog ret sandsynligt, at de Frø, hvoraf *A. caespitosa* ved Ivigtut er fremkommen, stammer fra Danmark eller en anden sydlig Lokalitet. Det vil derfor være af nogen Interesse at se, hvorledes Bladbygningen hos *A. caespitosa* fra Ivigtut forholder sig til danske Eksemplarers Bladbygning. Det viste sig, at den grønlandske *A. caespitosa* vel afviger fra den danske i samme Retning som den, i hvilken Individerne af *A. caespitosa* var. *brevifolia* fra Færøerne og Island afviger, men paa visse Punkter er Afvigelsen ikke saa stor som hos disse. Det undersøgte Blad havde 7 Ribber og 10 Bi-Karstrenge; Styrkevævet var ret kraftigt; paa Bladundersiden var Huden ud for Grønvævet udstyret med ikke faa

Spalteaabninger og tillige med ikke faa Smaatorne; paa Oversiden var Huden ud for Grønvævet forsynet med endnu flere Smaatorne, derimod var der ingen Papiller; ved de sidstnævnte Forhold stemmer Ivigtut-Planten overens med den danske *A. caespitosa*, saaledes som denne forholder sig i svagt Lys, hvoraf man, hvis ovennævnte Forudsætning om Ivigtut-Plantens Afstamning er rigtig, kan drage den Slutning, at Ivigtut-Planten har været i langt svagere Lys end det, for hvilket Planter paa solaabne Lokaliteter hos os er udsatte.

Ogsaa fra andre højnordiske Egne, f. Eks. Novaja Semlja, arktisk Sibirien og arktisk Europa, har jeg haft Lejlighed til at undersøge Eksemplarer af *A. caespitosa* var. *brevifolia*, og disse stemmede i Bladbygning væsentlig overens med Individerne fra Færøerne og Island, idet de havde færre Bi-Karstrenge, svagere Styrkevæv, færre Smaatorne og færre og i Reglen svagere Papiller end danske Eksemplarer af Hovedarten.

Af de øvrige *Aira*-Arter slutter *Aira alpina*, *A. bottnica* og *A. Wibeliana* sig meget nær til *A. caespitosa*; det vil maaske derfor ikke være uden Interesse at se, hvorledes disse Formers Bladbygning forholder sig især med Hensyn til Papiludstyr.

Aira alpina.

I Hovedtrækkene har vi her den samme karakteristiske Bladbygning som hos *A. caespitosa*; Bladet er her som der ved dybe Furer paa Oversiden delt i tresidet prismeformede Partier, og de tynde Steder mellem disse er styrkede ved Styrkevævstrenge indenfor Undersidens Hud (Fig. *F*); Karstrengenes og Styrkevævstrengenes Beliggenhed er ganske som hos *A. caespitosa*. Paa visse Punkter findes dog smaa Afvigelser. Det efterfølgende er baseret paa Undersøgelsen af 25 Individer fra 25 forskellige Lokaliteter, 10 paa Færøerne, 7 paa Island og 8 i Grønland; jeg har kun undersøgt et Blad af hvert Individ. Bladene er ofte sammenlagte; hos samtlige Individer var Bladribbernes Antal 7, der jo ogsaa var det almindeligste Forhold hos *A. caespitosa*, endskønt Bladene er betydelig smallere end hos denne. Da Bladene er smallere end hos *A. caespitosa* hos os, medens Ribbernes Tal er det samme, maa de enkelte Ribber blive smallere; hermed kan man vel sætte det Forhold i Forbindelse, at *A. alpina* har langt færre Bi-Karstrenge end vor *A. caespitosa*; af de færøiske Individer var der saaledes ingen, der

havde Bi-Karstrenge; af de 7 islandske Individer havde de 3 ingen, de 4 henholdsvis hver 1, 1, 1 og 4 Bi-Karstrenge; af de 8 grønlandske Planter havde 2 ingen, de 6 henholdsvis hver 1, 1, 2, 2, 2 og 2 Bi-Karstrenge. Hvad Styrkevævet angaar, har *A. alpina* de samme Strenge som *A. caespitosa*, men de er gennemgaaende svagere. Ledcellerne i Bunden af Oversidens Furer grænser ikke altid op til det underliggende Styrkevæv, men kan være adskilt fra dette ved et Lag tyndvæggede Celler, der vist i Reglen er Saftceller, sjældnere Grønceller. Bladene er ikke saa skarpt ru som hos *A. caespitosa*, idet Smaatornene ud for Bladrandenes og Ribbernes Styrkevæv er meget færre end hos denne; de er desuden svagere og ikke saa stærkt rettede mod Bladets Spids, men mere oprette. I mange Tilfælde var der paa Hudcellerne mellem Smaatornene en begyndende Papildannelse. Papillerne paa Hudcellerne ud for Grønvævet paa Bladoversiden var stedse talrige og gennemgaaende kraftigere end hos *A. caespitosa*; derimod fandt jeg ingen Smaatorne paa denne Del af Huden. Huden ud for Grønvævet paa Bladundersiden var kun i enkelte Tilfælde udstyret med ganske faa Spalteaabninger og ligeledes fandtes der her kun i enkelte Tilfælde nogle faa Smaatorne.

Sammenfatter vi nu disse Bemærkninger, kan man sige, at i Sammenligning med *A. caespitosa* paa solaabne Lokaliteter hos os er Bladene hos *A. alpina* mindre og mindre ru, idet Smaatornene i Bladrandene og paa Ribbekanterne er færre og svagere, endvidere er Bi-Karstrengenes Antal langt færre, Styrkevævet er svagere og der er langt færre Spalteaabninger og Smaatorne ud for Grønvævet paa Bladundersiden, derimod synes Papillerne paa Huden ud for Grønvævet paa Bladoversiden at være kraftigere og i hvert Tilfælde er de baade talrigere og kraftigere end hos *A. caespitosa* var. *brevifolia* paa Færøerne og Island.

Ogsaa fra andre højnordiske Egne har jeg haft Lejlighed til at undersøge *A. alpina*, saaledes fra Novaja Semlja, Spitsbergen, Nordskandinavien og Bjørneøen; i de fleste Tilfælde havde de undersøgte Eksemplarer et betydelig svagere Papiludstyr end Individerne fra Færøerne, Island og Grønland, og stemte i denne Henseende mere overens med de højnordiske Individer af *A. caespitosa* var. *brevifolia*.

Aira bottnica.

Af denne har jeg kun undersøgt 4 Individer. Bladet har samme ejendommelige Bygning som hos de to foregaaende Arter; Ribbernes Antal var som hos disse 7; 3 af Individerne havde ingen, 1 havde 2 Bi-Karstrenge; der fandtes ingen Smaatorne paa Huden ud for Grønvævet og ingen Spalteaabninger paa Bladundersiden; derimod var der talrige og kraftige Papiller paa Huden ud for Grønvævet paa Bladoversiden; *A. bottnica* stemmer saaledes i Bladbygning nærmest overens med *A. alpina*.

Aira Wibeliana.

Af *A. Wibeliana*, der i Følge Neuman (1) er en Bastard mellem *A. caespitosa* og *A. bottnica*, har jeg undersøgt 6 Individer, som nærmest stemte overens med *A. caespitosa*, men havde færre Bi-Karstrenge og ingen Smaatorne paa Huden ud for Grønvævet, hvorved de nærmede sig til *A. bottnica*.

Hvad Spørgsmaalet om Papillerne angaar, kan Resultatet af de i det foregaaende meddelte Undersøgelser sammenfattes paa følgende Maade:

1. *A. caespitosa, A. alpina, A. bottnica* og *A. Wibeliana* har i det væsentlige samme Bladbygning og de har alle Papiller paa Huden ud for Grønvævet paa Bladoversiden.
2. Hos *A. caespitosa* er Papillernes Tilstedeværelse betinget af en vis Lysstyrke; i Skygge udvikles Papillerne ikke eller de er faa og svage alt efter Skyggens Grad.
3. Paa Novaja Semlja, Spitsbergen, i Sibirien og Nordskandinavien er *A. caespitosa* var. *brevifolia* og *A. alpina* ens eller dog omtrent ens med Hensyn til Papiludstyr. — De to Arter er formodentlig omtrent lige gamle i disse Egne.
4. I Grønland er *A. alpina* rigt udstyret med Papiller; *A. caespitosa*, som ikke hører til den oprindelige grønlandske Flora men er indført i en sen Tid og kun fundet ét Sted, var her uden Papiller, forholdt sig altsaa som i Skyggen hos os, hvilket tyder paa, at den i Grønland er udsat for svagere Lys end paa solaabne Lokaliteter hos os (hvis det undersøgte Individ da ikke tilfældigvis har voxet i Skygge).

5. Paa Færøerne og Island har *A. alpina* ligesom i Grønland rigt Papiludstyr, medens dette hos *A. caespitosa* var. *brevifolia* er langt svagere. Denne Forskel i Forbindelse med Oplysningen i Punkt 4 kan maaske forklares ved og samtidig til en vis Grad tjene som Støtte for den Antagelse, at *A. caespitosa* var. *brevifolia* langt senere end *A. alpina*, maaske endog først ved Menneskets Hjælp, er kommen til Færøerne og Island, hvorfor den endnu ikke paa samme Maade som *A. alpina* er bleven omdannet ved de givne Kaar, specielt Lysforholdene.

Den Antagelse, at *A. caespitosa* først i en forholdsvis sen Tid er kommen til de nævnte Øer, støttes i øvrigt ogsaa noget derved, at *A. caespitosa* i det mindste paa Island fortrinsvis skal forekomme paa de af Kulturen mest berørte Lokaliteter.

Blide, 1900.

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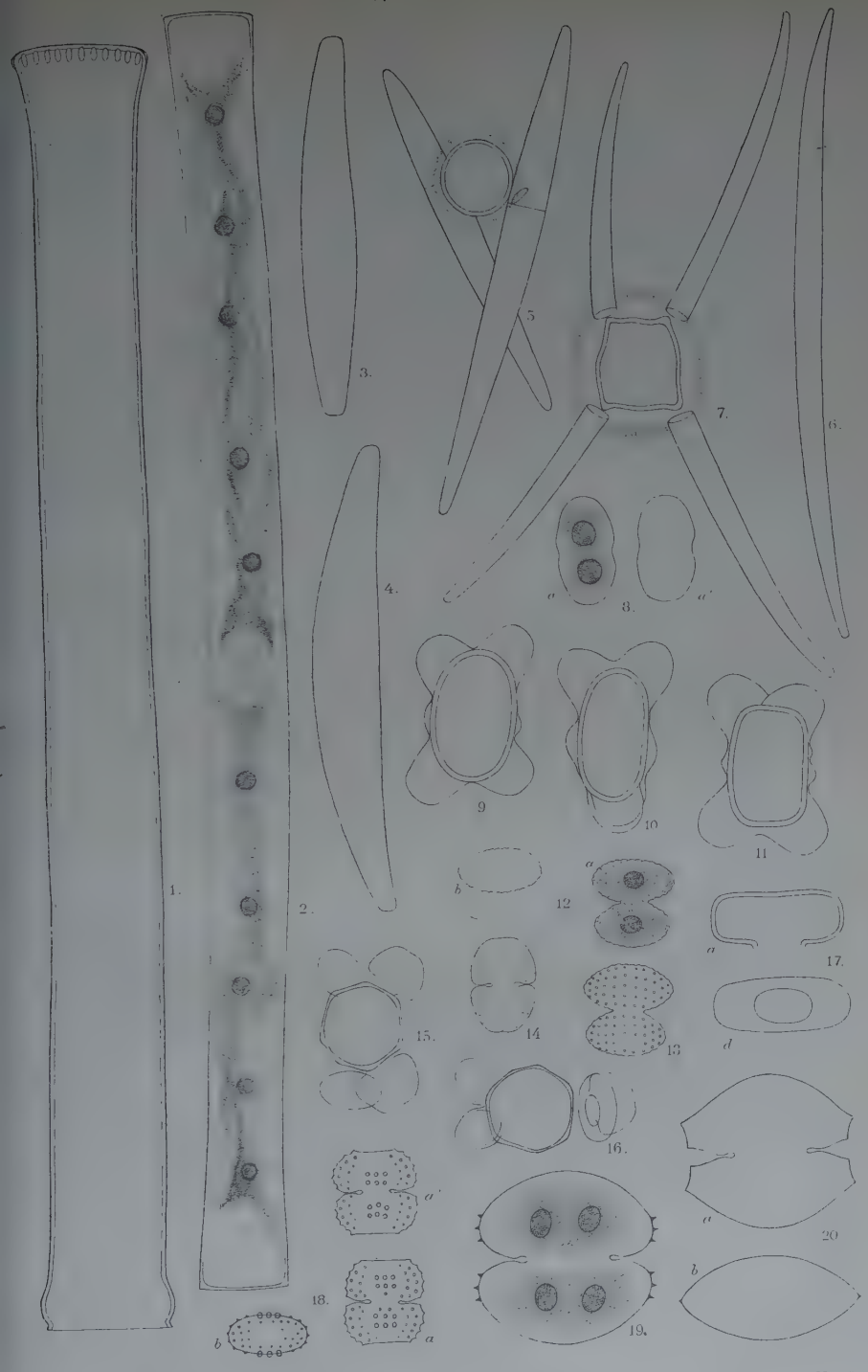
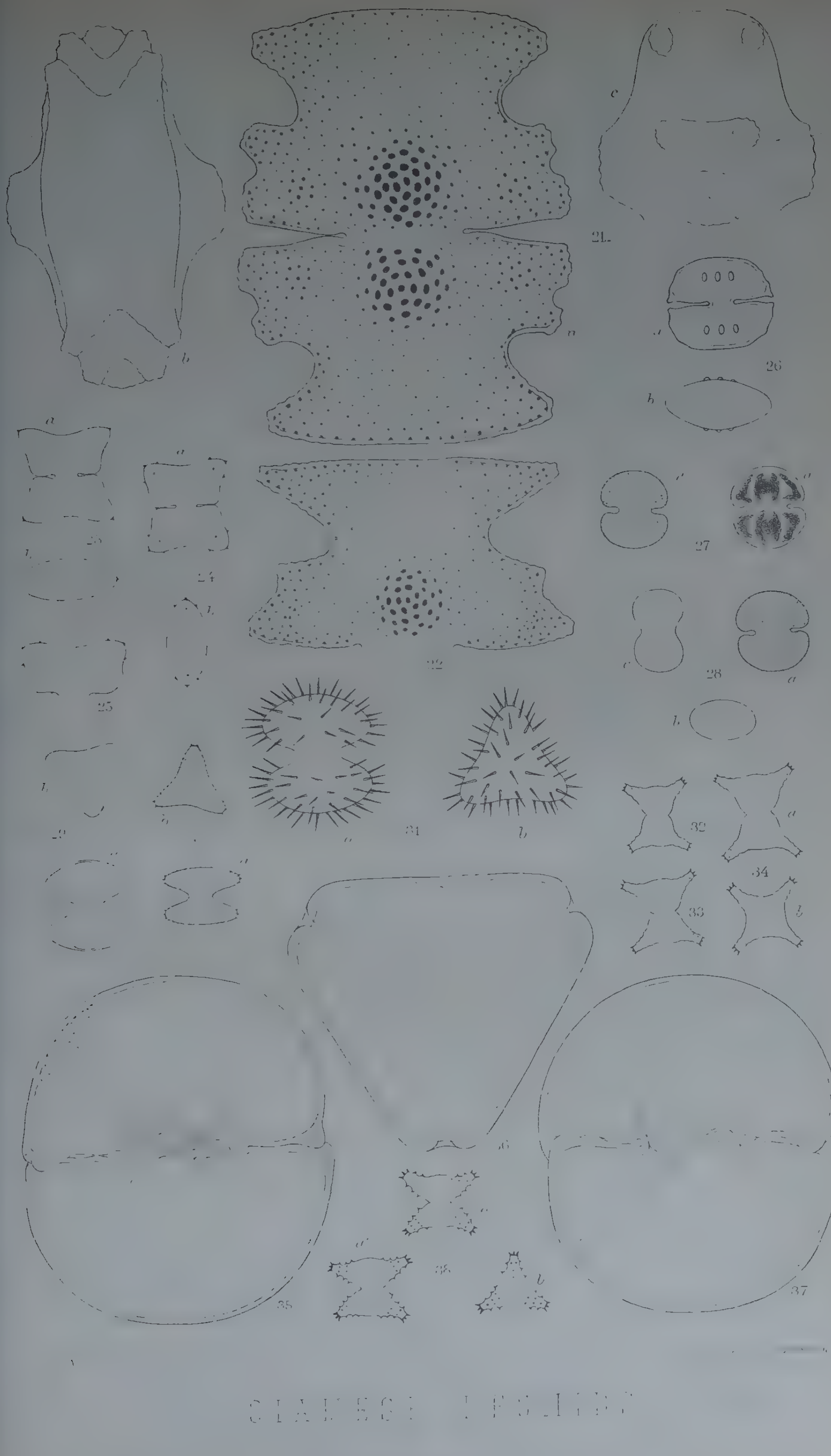
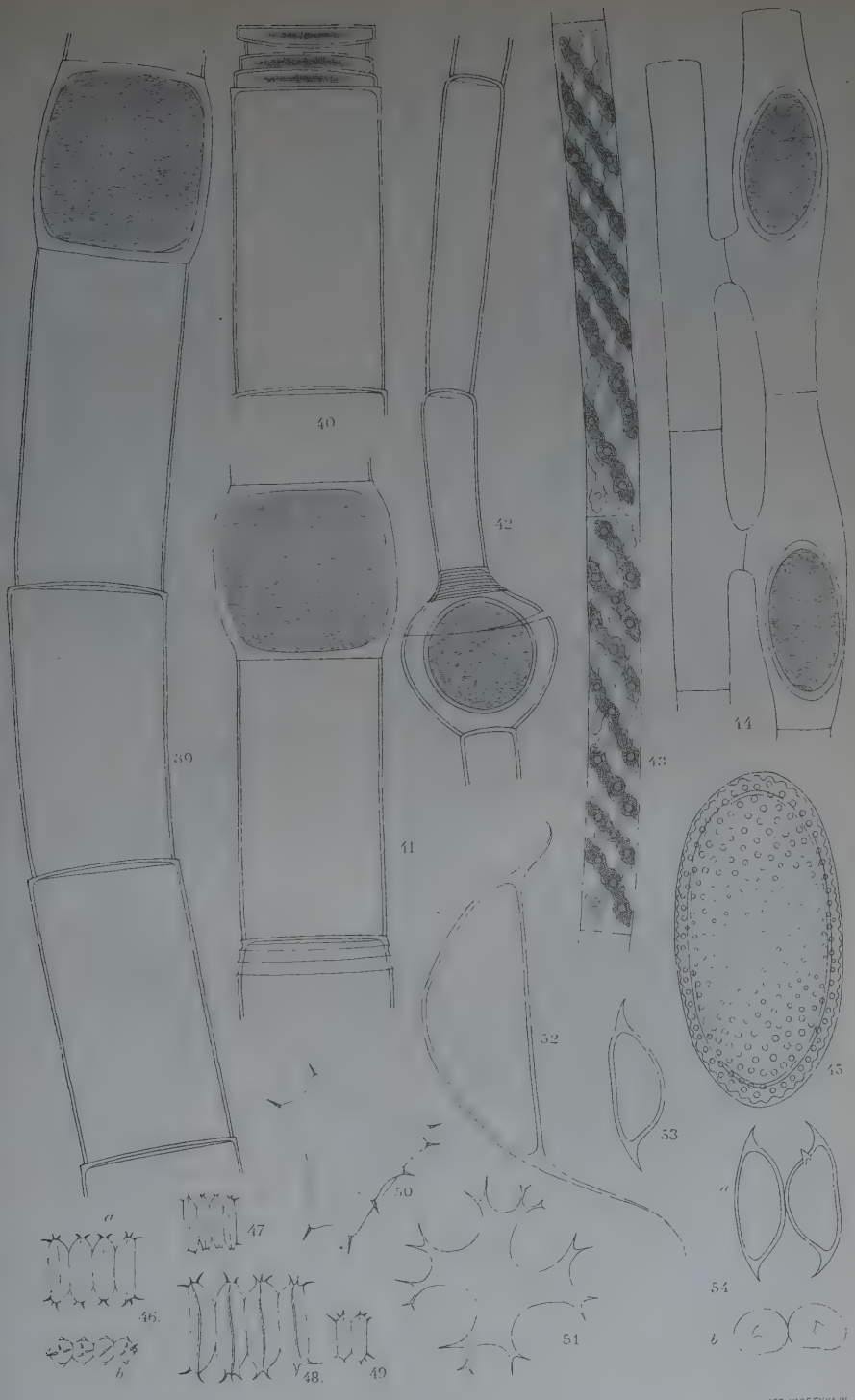


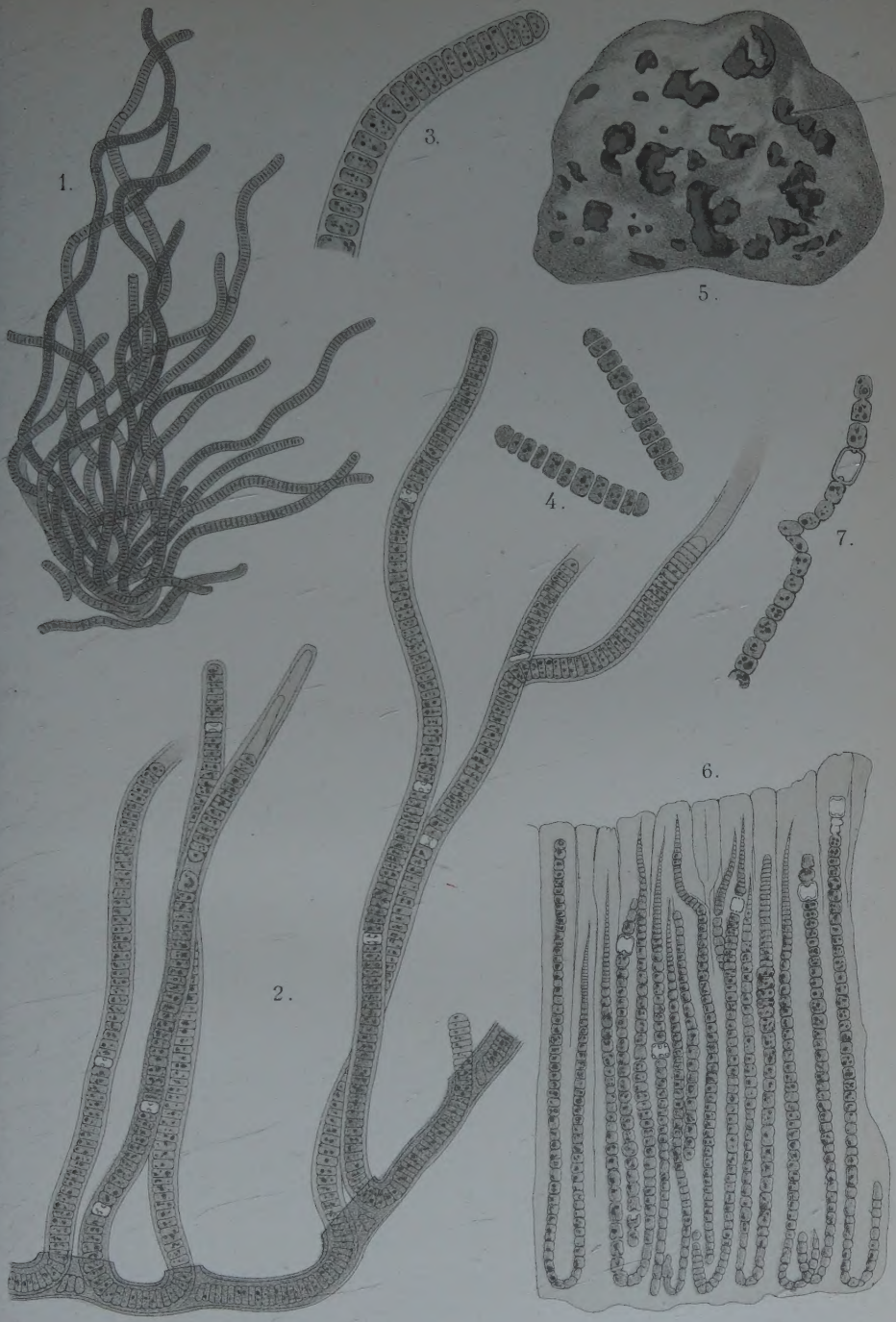
G S West ad nat. del

SIAMESE DESMIDS





AXEL E. AAMODT KJØBENHAVN



Gomont, del.

AXEL E. AAMODT, KJØBENHAVN.

1-4. SCYTONEMA SCHMIDTII, Gomont. 5-7. BRACHYTRICHIA MACULANS, Gomont.

INDHOLD.

(TABLE DES MATIÈRES.)

I. Afhandlinger. Side

II. Meddelelser fra den botaniske Forening i København.

Botanisk Forenings Adresse er: **Botanisk Museum, København K.**

Til Medlemmerne af Botanisk Forening.

Bopælsforandringer bedes anmeldte skriftlig til Bestyrelsen.

Opfordring.

Da den til „Dansk botanisk Litteratur" i 1898 føjede Opfordring om Hjælp ved Sammenstillingen desværre kun er bleven efterfulgt af ganske enkelte Forfattere, tillader jeg mig paany at anmode om Indsendelse af Særtryk (til Botanisk Haves Bibliothek eller til mig) af alle Arbejder med botanisk Indhold, der udgives herhjemme eller i Udlandet af danske Forfattere. Opmærksomheden henledes atter paa den i Botanisk Haves Bibliothek henlagte Protokol til Indførelse af Publikationerne.

A. Mentz.

Færdigt fra Trykkeriet d. 29. Oktober 1901.